THE MONTHLY

Review

A. E. S. CONVENTION

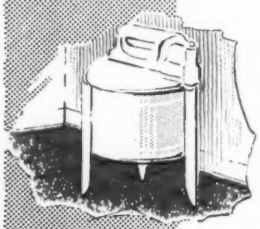
and

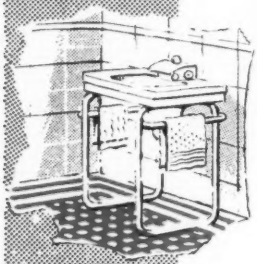
INDUSTRIAL FINISHING EXPOSITION

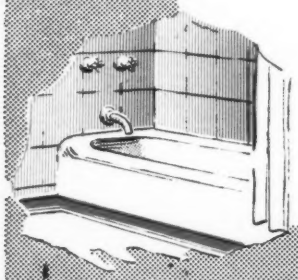
Detroit, Michigan — June 23-27

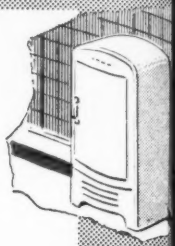
APRIL • • • 1947

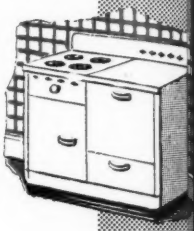
CLEANING PRIOR TO PORCELAIN ENAMELING

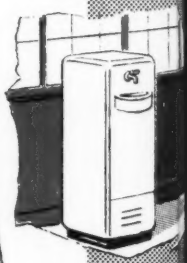












Production tests have shown that porcelain enamel rejects are reduced by using Clepo 26-E in the cleaning operation. The reason for these good results is that Clepo 26-E is very free rinsing and therefore does not interfere with the adherence of the nickel dip. Also Clepo 26-E has extremely high oil penetrating qualities so that even the most stubborn oils are completely removed in a one-minute cleaning time. Clepo 26-E is buffered so that the oil removed is kept in suspension and does not float on top of the solution.

If you would like to make arrangements for a production test in your plant right now, contact us as quickly as possible. The improved results obtained by using Clepo 26-E will amaze you.

Memo to Plant Engineer:

To Reduce Porcelain Enamel Rejects Specify Clepo 26-E for Cleaning prior to Nickel Dipping

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Finishing and PROCESSES PRODUCTS of ENTHONE RESEARCH

TEAR OUT
Check and Mail for Latest Information on BETTER METAL FINISHING

FINISHING PROCESSES

ALUMON — a process for treating aluminum and its alloys to prepare it for electroplating with other metals.

ALUMOX — a process for chemically oxidizing aluminum to impart protection to corrosive atmospheres and prepare it for organic finishes.

EBONOL "C" — a process for chemically oxidizing and blackening copper and copper alloys. The finish is also a good base for painting.

EBONOL "S" — a chemical process for blackening iron and steel operated in the temperature range from 285-290°F.

EBONOL "Z" — a process for blackening zinc and zinc alloys.

FINISHING PRODUCTS

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INHIBITOR 7C — a powerful inhibitor for hydrocloric acid pickles either hot or cold to prevent attack upon base steel. The inhibiting action is approximately 99%.

COMPOUND NR-37- an organic material which is added to hot water used for drying after pickling to prevent rusting or yellow staining of steel. No film is left upon the work to interfere with organic finishing.

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CLEANER 100 — an alkali cleaner of very high detergency for cleaning steel by soaking or electrolytic means.

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ENAMEL STRIPPERS: Various solvent and emulsion type strippers are available for rapidly removing enamels, lacquers and other organic coatings from all metals without attack.

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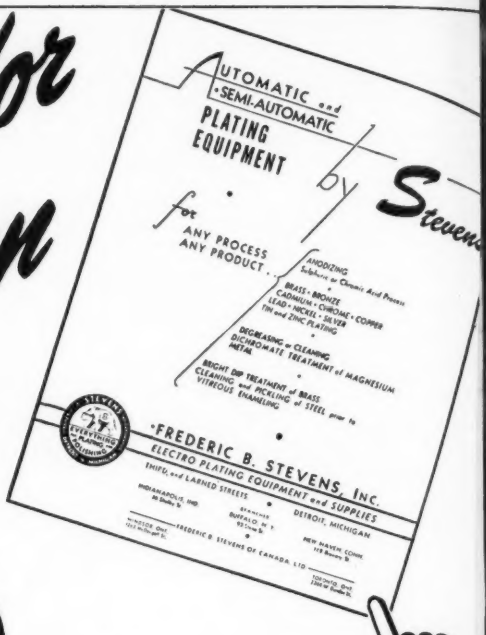
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THE MONTHLY

Review

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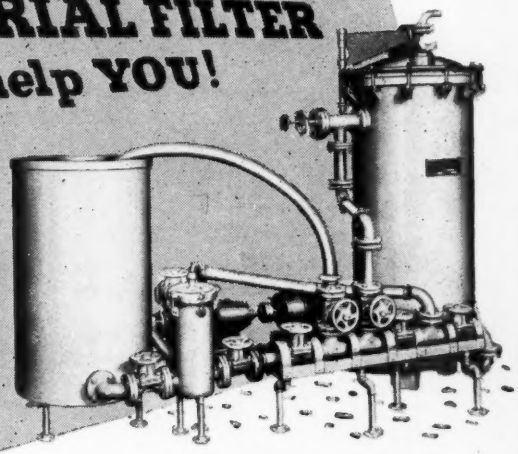

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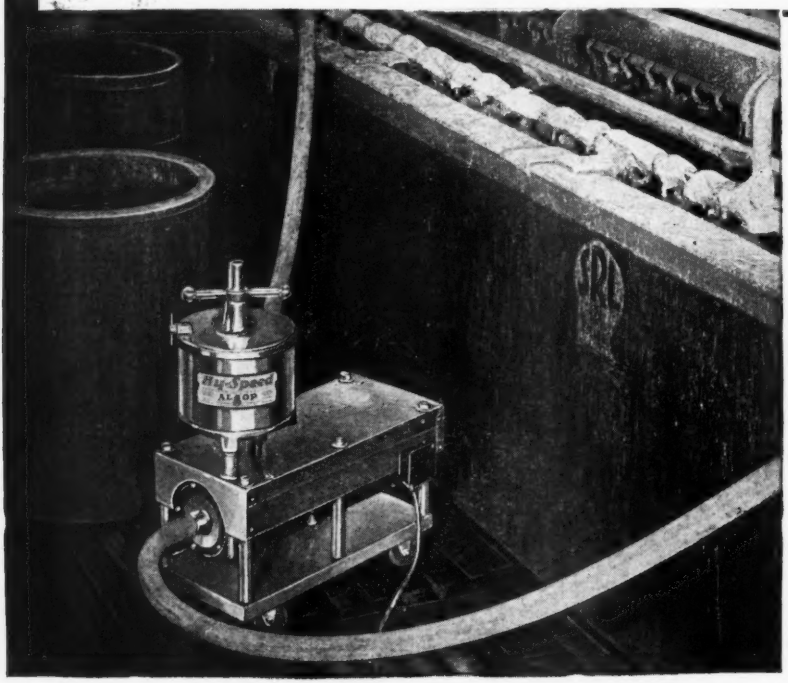

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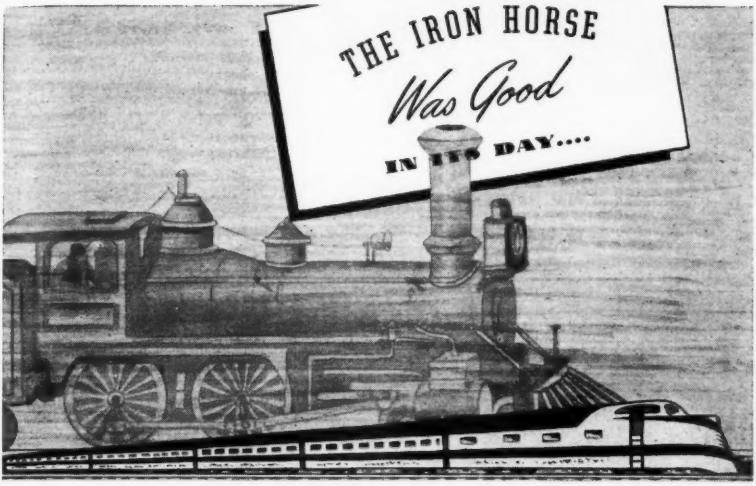

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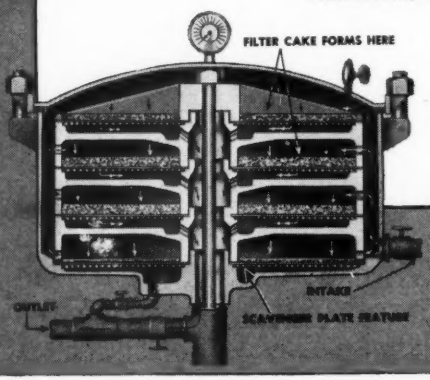

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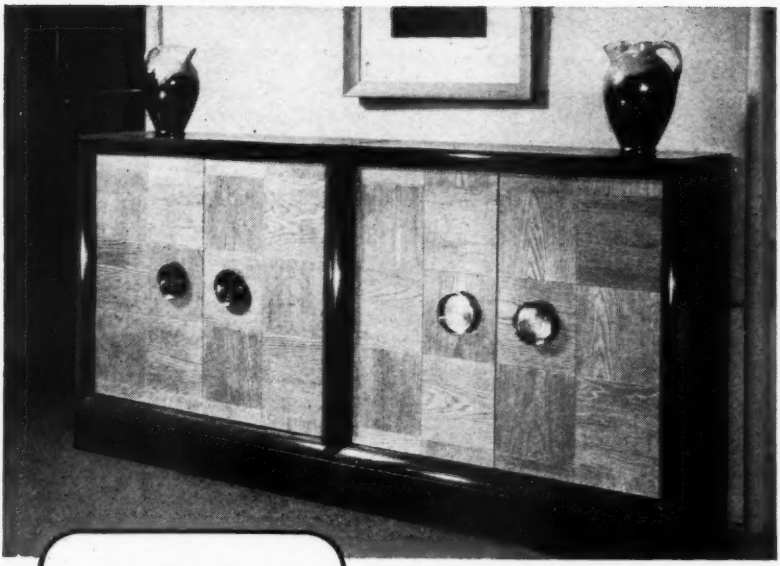

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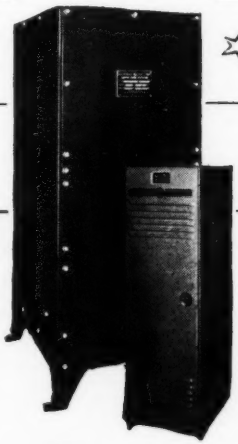

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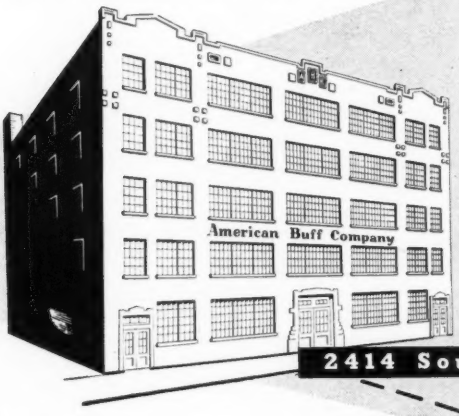

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During the past war years and during the immediate post-war period, it was our duty to supply you with as many Buffs as was humanly and mechanically possible. We did this. In fact, we produced *more* Buffs than others believed could be accomplished. Where others failed, we kept our customers' plants in full operation.

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LaSalle Street

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MORE AND BETTER AMERICAN BUFFS is our watchword now. Visit our new plant and see us. Or, write us for immediate, dependable service.

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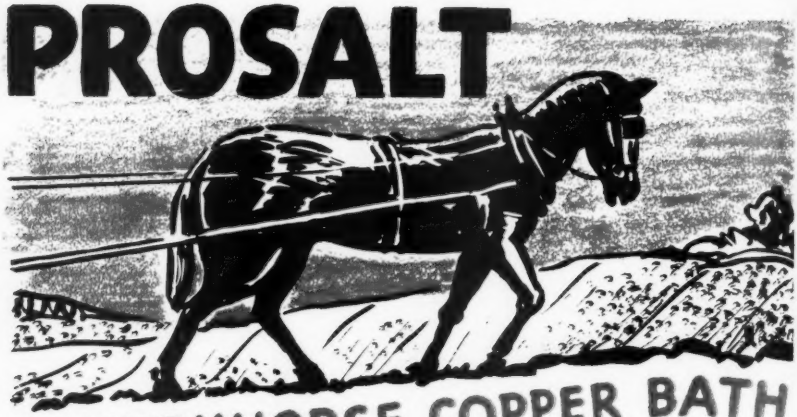
PROSALT



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PROSALT is a liquid addition agent for a copper cyanide bath used with direct current.

This PROMAT QUALITY product has many advantages—BROADER operating range; LOWER optimum temperature; Fine grained, lighter color, more ductile deposits. Existing Rochelle baths may also be converted by the addition of 130 cc. Prosalt per gallon.

Make-Up Analysis Prosalt Copper Bath	Cost
Copper cyanide, 3.5 ounces per gallon	$0.0764
Sodium cyanide, 4.6 ounces per gallon	0.049
Sodium carbonate, 4.0 ounces per gallon	0.0075
PROSALT, 130 cc. per gallon	0.184
	$0.3169 per gallon

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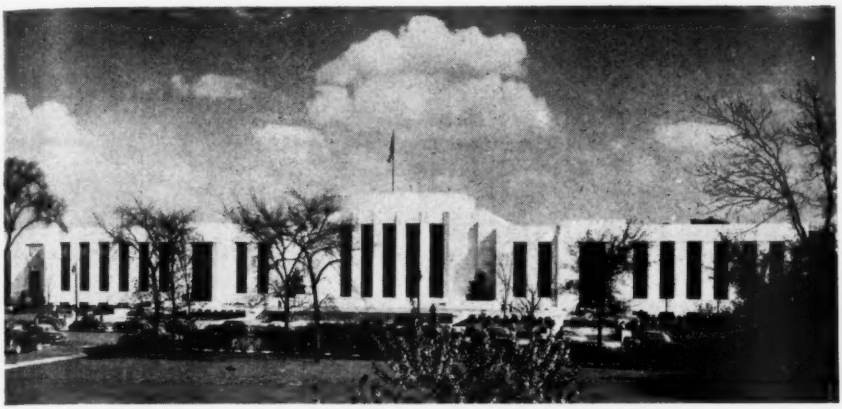
Home of the Engineering Society of Detroit



INDUSTRIAL FINISHING EXPOSITION

Detroit, June 23 to 27, 1947
Held in cooperation with the A. E. S. CONVENTION

Metal Finishing history will be made in Detroit in June, 1947.

This great industrial center—"Plating Headquarters of the World"—will be host to the American Electroplaters' Society's Annual Convention—the principal feature of which will be the mammoth Industrial Finishing Exposition.

This Exposition—the first the Society has held in ten years—will provide the first post-war opportunity for its members, plant executives, engineers and technicians to see the great forward strides which this $300,000,000 Industry has made during the past few years.

Convention Hall, where the Exposition will be held, covers a full city block, with entrances on both the Woodward and Cass Avenue sides, and is easily accessible from the downtown hotels.

A large portion of the Exposition space has, at this early date, been reserved by Manufacturers and Suppliers to the Metal Finishing Industry. Many of those exhibits will be in operation.

A representative group of manufacturers of plated articles have reserved space, and will display a wide range of finished products to create interest in plated finishes. Those displays will be of great educational value to the general public who will be cordially invited to attend.

The American Electroplaters' Society, whose headquarters will be in the Hotel Statler, will hold five technical sessions, covering a wide range of subjects of great interest to electrochemists and process engineers.

(Continued on Page 462)

1947

American Electroplaters' Society

34th Annual Convention

and

Industrial Finishing Exposition

DETROIT—*Plating Headquarters of the world*

June 23-27, 1947

Process Engineers
Production Engineers
Standards Dep't. Engineers
Laboratory Heads

CONVENTION HEADQUARTERS
HOTEL STATLER

•

EXPOSITION
CONVENTION HALL

Don't miss this opportunity to see the greatest display of new and up-to-date Plating and Metal Finishing Equipment and Supplies ever assembled under one roof.

Plan now to attend this mammoth display held in conjunction with the 34th Annual Convention of the American Electroplaters' Society.

Meet the men who can give you pertinent facts pertaining to recent developments in the metal finishing industry.

See how "the other fellow" is operating thru the Industrial Visitations the Committee has arranged as an Educational Feature.

See the diversified line of manufactured items which will be displayed at the Exposition.

The educational value of the Exposition cannot be over-emphasized. The buying public will see what is involved in producing metal finishes. The housewife will see a display of both manufacturing methods and finished products. The manufacturing executive will see metal finishing in all its phases. The electroplater and plant engineer will see the newest technical developments.

For information write

INDUSTRIAL FINISHING EXPOSITION

4484 CASS AVENUE • CONVENTION HALL • DETROIT 1, MICHIGAN

The Independence of the Branches

The strength of the American Electroplaters' Society ultimately depends on the strength of its Branches. Since strength and independence go together, the Branches have always enjoyed a full measure of the latter.

The officers that are elected to govern a Branch are of the Branch's own choosing without the slightest interference from any other Branch or the National Officers.

The candidates for membership have their record investigated by the members of the Branch they select to affiliate with, and their election is entirely up to the will of the members of the Branch. Any member who is deemed worthy can be elected an Honorary Member of the Branch.

Each Branch selects its own meeting place and time and frequency of meeting. The meeting can be for business, education, or social functions, or a combination thereof at the will of the Branch members. It can be "closed" or "open" to visitors.

Each Branch can, if the members wish, have an Annual Meeting with an Educational Session and a get-together Banquet. Two or more Branches can combine and hold regional meetings.

The speakers at regular meetings, annual meetings and regional meetings are selected by members of the Branch or Branches. The subjects are chosen at the discretion of the committee appointed by the members and any member feels free to make suggestions.

When special affairs are held, there is generally a fee. There is also revenue from advertisements in the printed program. All proceeds above expenses go to the treasury of the Branch or Branches that arrange the affair.

The initiation fee from new members goes to the treasury of the Branch. The National organization receives only a percentage of the minimum dues specified in the Constitution, and the remainder, including any addition to the dues voted by the Branch, goes to the Branch treasury.

For the percentage of dues received by the National organization, each member receives each month a copy of THE MONTHLY REVIEW and also a copy of the *Proceedings* which contain all the papers presented at the Annual Conventions and the members' discussions.

The Branch that is host to an Annual Convention is given valuable assistance by the Officers of the National Society and a large percentage of the revenue.

The Officers of the National Society are elected at each Annual Convention. They have no power whatever over the operation or "running" of a Branch organization.

These are the laws according to the present Constitution and also the laws of the proposed Constitution. The independence of the Branch organization is not affected in any manner.

There are two changes in the proposed Constitution that are of interest to the members. They have been made for the best interest of all the Branches collectively. One is the payment of dues to the Treasurer of the National organization; the other is the method of election of officers.

The collection of dues is the hardest task that a Branch Secretary has to perform. During the year, he is compelled to make request after request to make many members pay their dues. Those who fail to pay their dues are often carried by the Branch for two or three years with the hope that they will not be lost. During that time the Branch has to pay out of its treasury the same per capita tax for the delinquent member as for the member in good standing. Money lost in this manner cannot be refunded and is often a real drain on the Branch funds.

The delinquent member receives regularly

THE MONTHLY REVIEW and the copy of the *Proceedings* of the Annual Convention. He pays nothing for them while in arrears, and nothing is paid if the Branch is compelled to drop him from its membership roll. Under the present Constitution there is no way in which either the Branch or the National Society can be reimbursed.

Under the new Constitution all dues shall be paid into the treasury of the National body. When any member is three (3) months in arrears he will not receive THE MONTHLY REVIEW or the *Proceedings*. However, when a delinquent member pays up, he does receive the back copies of the publications due him.

This arrangement does not mean that the National organization can suspend a delinquent member; that is strictly a function of the Branch to which he belongs.

With the increase in the dues, each Branch will receive an increased amount of money from each member in good standing and will not have to pay a per capita tax for those who are in arrears.

Under the present Constitution the Officers of the National Society are elected by the Delegates—three members from each Branch.

It is well known that there are slates of candidates, not one but several, and throughout the Convention there is praise or condemnation of candidates whose names are to be offered in nomination at the final business session.

It is quite possible for a group to work hard for its "slate" and be successful. That is the natural result of the present method of election of National Officers.

Under the proposed Constitution, the Officers will be elected, not by a few Delegates, but by the members of all Branches of the organization. Several months before the Annual Convention, the Executive Board of the National organization selects a Nominating Committee, no two members of which can be members of any one Branch and none of which can be a member of the Executive Board.

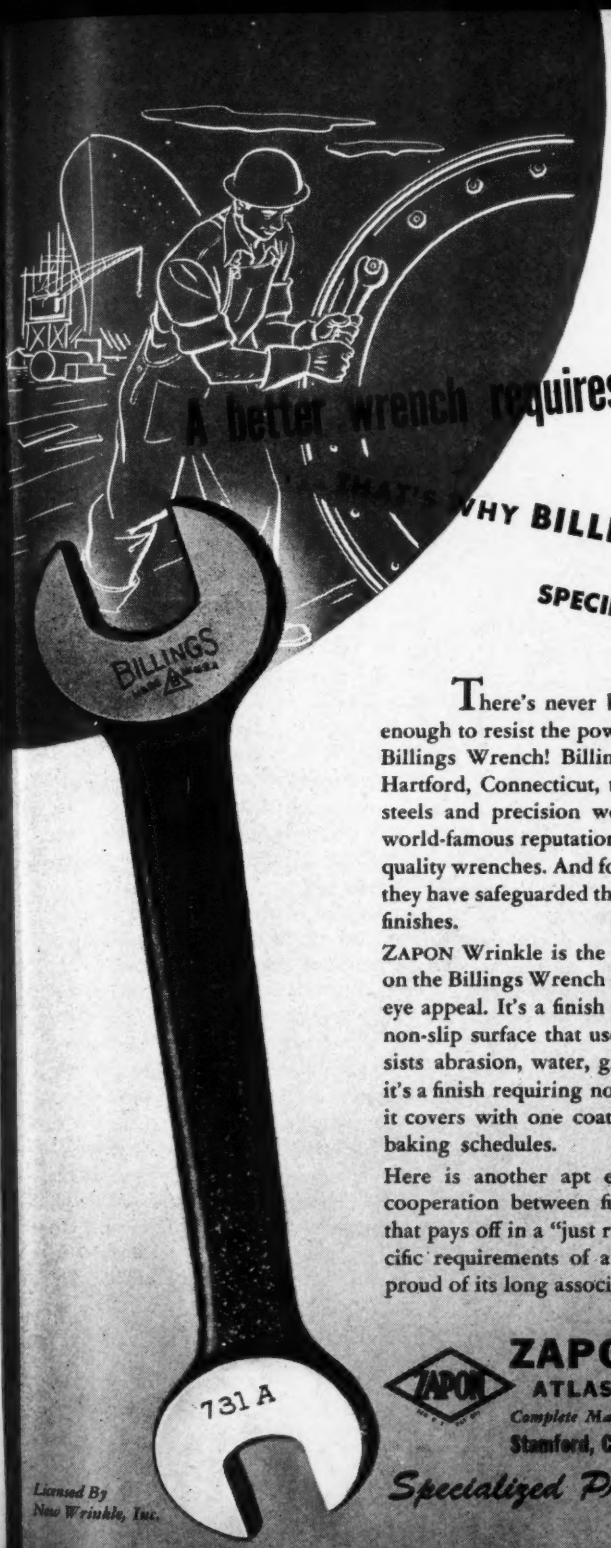
Printed ballots with the names of those nominated and *also blank spaces for any member to write in the name of a member* shall be sent to all members of all the Branches. When the member has marked his ballot he must put his ballot in *a sealed envelope* and send it to the National Society. Tellers, not more than one from any one Branch and none from the Executive Board, shall count the ballots and report directly to the members at the business session of the Annual Convention.

In this manner there can be no "slate". There are no groups of members to buttonhole. Delegates will be eliminated. The Officers will be elected by your vote, my vote and the vote of each member of the A. E. S.

Branches today are independent organizations and run their own affairs, social, educational and financial, and will continue to do so under the proposed Constitution.

It has been my good fortune to have been one of the few men who joined with Charles H. Proctor at the first meeting of what became the A. E. S., a group of eight men which has grown to nearly 5,000. As chairman of the Committee which drew up the first Constitution and as a member of every subsequent committee for its revision, I have always held it my duty to act in the interest of all the members of the organization. That came first and always will. The reward to me has been great—far exceeding anything that could have been hoped for. If the proposed Constitution in any way was against the best interests of the members of A. E. S. or of any individual member, I would have withdrawn from the Committee and strongly voiced my protest. Not having had the opportunity of receiving much formal schooling, the A. E. S. has been my university, and I always will be true to my Alma Mater.

George B. Hogaboom



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Electrodepositors' Technical Society's 'Coming-Of-Age' Celebration

A very interesting function was held by the Electrodepositors' Technical Society on Saturday, December 7, at the Society's headquarters, the Northampton Polytechnic, London, when the Twenty-first Anniversary of the foundation of the E. T. S. was celebrated. A large number of members and many visitors were present at the Soiree which opened the proceedings. They were then continued in the main lecture theatre of the old Northampton building.

A series of colored graphs and diagrams illustrating the growth of the Society had been erected on the wall behind the platform, showing the achievements during the Society's history, the steady growth of publications and membership, etc. Examples of some of the latest types of electrodeposits and electrolytically polished surfaces besides intricate instruments which have been developed in recent years for the control of electrodeposits were exhibited on the bench before the gathering.

Opening Remarks

Opening the proceedings, Dr. S. Wernick said it was a pleasure to welcome not only old and new members but special visitors representing sister societies and institutions as well as a large contingent from the Midlands Centre, that lusty and vigorous offspring of the parent society.

Twenty-one years ago, to be exact on Wednesday, December 9, 1925, there took place an important meeting in that same building, the first meeting of the Electroplaters' and Depositors' Technical Society, as it was first named. It was difficult to chronicle all those connected with the initial formation of the Society. However, there were four outstanding individuals who might be looked upon as the founders, namely, Mr. Spiers, at that time Secretary of the Faraday Society which took a very keen interest in the Society's formation; Mr. Samuel Field, the Head of the Chemistry Department of the Northampton Polytechnic; Mr. W. E. Harris, who became the Society's first Honorary Secretary; and lastly, the late Mr. William James, the first Honorary Treasurer and father of the present Honorary Treasurer of the Society, Mr. F. L. James, who has continued the tradition so ably ever since.

From the time of that first meeting, some hundreds of meetings have followed and have taken place at regular intervals at the Northampton Polytechnic, and later with the formation of the Midlands Centre, in Birmingham. The majority of the papers were published and some twenty Volumes of the Society's Journal have been issued, thus faithfully fulfilling the prime function of the Society which was to publish and disseminate information on electrodeposition. Some of the original work published in the Journals had proved of the highest importance in the development of electrodeposition, and special tribute should be paid to the work of the "Woolwich School". There was no doubt that the quality of the Society's publications compared at least favourably with that of corresponding societies abroad.

The Council of the Society was actively engaged in tackling the problem of securing adequate funds for continuing its work, which had grown in size and importance, and he believed that the industries which the Society had served so well would rally round them and subscribe generously to the new Publications and Development Fund which was being inaugurated to assist this work.

The President then read a number of extracts from messages of congratulation which had been received from sister societies, among them the Chemical Society, the Royal Institute of Chemistry, the Institution of Electrical Engineers, the Faraday Society, the American Electroplaters' Society, the Electrochemical Society, and a number of Continental societies.

Award of E. T. S. Medal

The Council had decided to institute a Medal, which was to be known in future as

the E. T. S. Medal, and this would be awarded at intervals, which might be annually or longer, to individuals who it was considered had performed outstanding services in the field of electrodeposition. It was hoped that the scope of the Medal would be international. It had been unanimously decided by the Council that no more meritorious claim could be put forward for the first award than the name of its first President. Mr. Samuel Field. It had not been possible to cast the medal in time for this celebration, but it was hoped that it would be possible to award it on the occasion of the Third International Electrodeposition Conference which was being planned for May, 1947. In the meantime, Dr. Wernick handed Mr. Field a scroll as a token of the award.

Mr. Field's Address

Mr. Field, addressing the assembly, indicated his considerable gratification at the honour which has been conferred upon him. He paid tribute to the memory of Mr. Spiers and also Mr. William James, whose vision and foresight had resulted in both practical platers joining the ranks of the Society together with the research workers, whom Mr. Harris had been largely instrumental in persuading to join the Society's activities. He felt that the Society owed a great deal of its success to two things in particular, first, the welding together of the two types of workers, and secondly, the publication of research work, a great deal of it of the fundamental type, in the Society's Journal.

In reminiscent mood, Mr. Field recalled some of the early days of his teaching career and the crude way in which the subject of electroplating was taught in 1897, when platers had very little conception of how to meet the requirements of electrodeposits, or how to test those deposits or the solutions from which they were obtained.

Professor R. S. Hutton, who succeeded Mr. Field as President in 1930, recalled that it was while he was in office that the Society had participated so strikingly in the Faraday Centenary Exhibition, and probably by this means had directed attention on the part of a wider public to the activities of the Society and those who were engaged in research in this field.

He came from a family which had for several generations past been directly connected with the science and art of metal finishing, and recalled that his great-grandfather practiced he art of close plating—the surface application of silver sheet to base metals by thermal means—in Sheffield at that time.

The vision and skill of industrialists, particularly in the Midlands one hundred years ago, could not be belittled when it was remembered that silver plating was already being practiced twenty-five years before the dynamo had been invented. The platers of that time had to use Smee Cells as a source of current, yet for all that they were enterprising enough to employ chemists on the researches of the time. He recalled the work of Elkington in particular, and also Mason in Birmingham, who had pioneered the electro-refining of copper; this is carried out extensively now in America. It was a matter of interest, too, that the very first dynamos which were built were applied in electroplating and refining work before they were ever used either as a source of power in industry or for electric lighting.

Mr. A. W. Hothersall, in acknowledging the tribute to the "Woolwich School", reminded those present that the name of the Society's third President, Mr. D. J. Macnaughtan, would always be associated with the researches which were carried out at Woolwich, since they could very largely be attributed to his foresight in the first place. He said that while some developments were spectacular, much of the progress in electrodeposition came about as a result of a number of improvements in known processes, and it was by such improvements that a great deal of useful research work had been carried out during the war years particularly. The Society had published something like 250 papers, of which about one-third dealt with original research, the rest being concerned with surveys of industrial processes, plant, equipment, etc. He emphasized the importance of continuing to publish at least as large if not a larger proportion of papers dealing with research.

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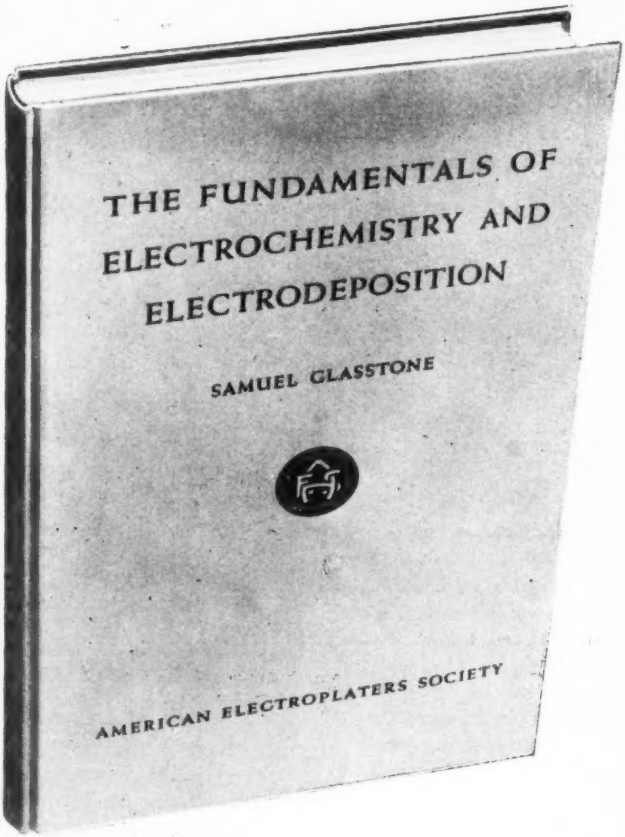

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PROPOSED NEW CONSTITUTION AND BY-LAWS

BY

THOMAS SLATTERY GEORGE B. HOGABOOM
CARL E. HEUSSNER LESLIE BORCHERT
WALTER L. PINNER (Chairman)
Constitution Revision Committee

CONSTITUTION

PREAMBLE

NAME, OBJECT

This society shall be known as "The Electroplaters' Society" (hereinafter referred to as "The Society") and incorporated under the laws of the State of New Jersey.

The objects of this society shall be the improvement and dissemination of knowledge of the art and science of electrodeposition, the finishing of metals, and allied arts; the development of a cooperative spirit of friendship and mutual assistance among its members.

PART I. THE SOCIETY

ARTICLE I. FUNCTIONS

Section 1. Authority: The Executive Board of the Society shall be the governing body and shall consist of the Past-President, President, First Vice-President, Second Vice-President, Third Vice-President, Treasurer, and the Presidents of the Branches. All references to the Executive Board in this constitution refers to the above body. At any meeting of the Executive Board, four (4) of the elected officers of the Society and two (2) Branch Presidents shall constitute a quorum.

ARTICLE II. MEMBERSHIP

Section 1. Classes: The Membership of the Society shall consist of Members, Student Members, Sustaining Members and Honorary Members.

Section 2. Members: Any person interested in the objects of the Society may be nominated for election as a Member.

Section 3. Student Members: Any person not over 25 years of age and regularly enrolled in full time courses of an accredited university or other institution of learning, and who is interested in the objects of the Society, may be elected as a Student Member.

Section 4. Honorary Members: Honorary Membership shall be conferred by a majority vote of the Society in Annual Meeting upon any person whose knowledge and services have added or will add to the welfare of the Society. Any Branch desirous of having a person elected to Honorary Membership shall submit the name of such person with the necessary information to the Executive Board, a majority of which must approve the application before presentation to the Society for election.

Section 5. Sustaining Members: Any firm or person directly interested in the electroplating and metal finishing industry or in the aims and welfare of this Society may upon the contribution of not less than $100.00 per year become a Sustaining Member. The acceptance of such contribution by a majority vote of the Executive Board shall constitute membership. Sustaining Membership shall terminate when contributions have ceased for one fiscal year. All funds received from Sustaining Members shall be used only for investigation of problems and processes directly related to research in the art and science of electroplating or metal finishing or any of its

allied arts. The names of Sustaining Members shall be published each year in the *Proceedings*. Sustaining Members shall receive copies of THE MONTHLY REVIEW, Annual *Proceedings* and all literature pertaining to the art of electroplating or allied arts, issued by the Society.

Section 6. Student Members and Sustaining Members shall have all privileges of membership except that of voting and holding office.

Section 7. Application for membership shall be made to the Executive Secretary on the proper form duly completed by the candidate. All such applications shall be considered by the Executive Board. The application form will require three references by the candidate. Unless a check with these references or any others selected by the Executive Board reveal an objection to the candidate within thirty days, and unless that objection shall have been subsequently upheld by a majority of the Board, the candidate shall, subject to compliance with ARTICLE V, CONSTITUTION, be considered as having been duly elected.

Section 8. Familiarity with Constitution: Each applicant for membership shall receive a copy of the Constitution and By-Laws, which he shall be expected to read and accept, and shall not be allowed to plead ignorance for any violation.

Section 9. Rejection: Any applicant for membership who has failed to qualify according to the Constitution and has been rejected cannot apply again for membership until after a period of one year.

Section 10. Transfer: Any member in good standing transferring from a locality served by one Branch to a locality of another Branch can upon request become a member of the Branch in the locality to which he transfers.

Section 11. Resignation: No member can resign unless he is in good financial standing.

Section 12. Expulsion: On proof that a member has made false or misleading statements in his application for membership, or has acted contrary to this Constitution, he shall be expelled from the Society and all moneys received from him shall be forfeited.

Section 13. Reinstatement: Any member suspended or expelled from the Society may be reinstated by a majority vote of the Executive Board.

Section 14. Application Fee: The minimum application fee shall be Five Dollars ($5.00) to be submitted with the application.

ARTICLE III. DUTIES OF MEMBERS

Section 1. Voting: All Members, except Student Members and Sustaining Members, may vote at the Annual Meeting except when excused by the President.

ARTICLE IV. OFFICERS

Section 1. The Officers of the Society shall consist of a Past-President, President, First Vice-President, Second Vice-President, Third Vice-President, Treasurer, Executive Secretary, Residing Legal Officer and an Executive Board. A member residing in New Jersey shall be appointed to serve as the Residing Legal Officer of the Society in the State of New Jersey. All officers of the Society except the Executive Secretary and the Residing Legal Officer, shall be elected. The Executive Board shall consist of the elected officers of the Society and the Presidents of the Branches. The Executive Secretary and Residing Legal Officer shall be appointed by the Executive Board, and shall continue to serve until his successor is appointed and qualified to serve.

Section 2. Qualifications: Each elected or appointed officer of the Society must be a member of the Society in good standing.

Section 3. Term: The term of each elected officer shall be for one year, or until his successor shall have been elected or appointed. No person may hold the same office more than two years in succession.

Section 4. Vacancies: In the event of a vacancy in the office of President, the Vice-Presidents shall succeed in the order of their rank. In the event of a vacancy in the office of the Treasurer, a Treasurer shall be appointed by the Executive Board to complete the unexpired term.

Section 5. Past-President: The retiring President shall become the official Past-President, and a member of the Executive Board, but shall continue in office as Presi-

dent until a new President is elected and installed.

Article V. Finances

Dues

Section 1. The annual dues shall be $10.00 for Members and shall be allocated as follows: 50% to the General Fund, 40% to the Branch, and 10% to the Research Fund.

Section 2. The annual dues shall be $5.00 for Student Members and shall be allocated as in Section 1.

Section 3. Members who are not affiliated with a Branch shall have 90% of their dues allocated to the General Fund and 10% to the Research Fund.

Section 4. All funds received from Sustaining Members must be placed in the Research Fund.

Section 5. The $5.00 application fee shall be paid to the Branch with which an elected member becomes affiliated. In the event that a member does not affiliate himself with a Branch, the application fee shall go to the Society.

Article VI. Meetings and Conventions

Section 1. The Annual Meeting: The regular meeting of the Society shall take place during the Annual Convention for the purpose of transacting any business that may be brought before it.

Section 2. Time: The Annual Meeting and Convention shall be held between June 1 and September 30. In the event of national emergency, the Executive Board may waive the Annual Meeting and conduct the affairs of the Society by letter ballot.

Section 3. Place: The Convention shall be held at a place decided upon at a previous Convention. Invitations from Branches desiring to entertain the Convention shall be announced at the last business session of the Convention. When more than one Branch presents invitations, the selection shall be made by ballot. In the event that no invitation is received, the Executive Board shall select a convention place with the consent and cooperation of a local Branch. If for a valid reason the convention city must be changed, the location of the Convention will then be left to the Executive Board, with the consent of the Branch in the newly chosen location.

Section 4. Special Meetings: A Special Meeting may be called at the discretion of the Executive Board. It also may be prayed for by at least 100 members in good standing, not more than 20% of which shall be members of any one Branch. The purpose of any Special Meeting shall be stated in writing and the Executive Secretary shall send a copy of the request and purpose of the meeting to each member of the Executive Board. No Special Meeting shall be called to consider any matters that can be decided by law or by the Executive Board in accordance with this Constitution and By-Laws.

Section 5. Fiscal Year: The fiscal year of the Society shall commence on the First day of May. All the financial reports shall be made from and all transactions shall be closed to conform with the ending of the fiscal year of the Society, namely, the Thirtieth (30th) day of April.

Section 6. Privilege of the Floor: Any person who is not a member of the Society may be granted the floor of a Convention by the President or Presiding Officer, but shall have no vote.

Article VII. Charters

Section 1. Granting and Voiding: The Executive Board is authorized to grant charters to groups that have organized in accordance with this Constitution and By-Laws. The Executive Board shall have the right to declare a charter forfeited.

Section 2. Classes: The Society shall grant two classes of Charters: Temporary and Permanent.

Section 3. Temporary Charters: A Temporary Charter may be granted to any group of persons who can comply with the following requirements:

(a) That there shall be not less than ten persons who can qualify as Members under the laws of this Constitution.

(b) That said group pray for a Charter in writing, and that each member over his

signature pledge his loyal support to the Electroplaters' Society and promises to abide by its Constitution and By-Laws.

Section 4. Duration of Temporary Charter: With the approval of the Executive Board, the President may issue a Temporary Charter or revoke the same at any time. This Charter shall be valid until the "Charter Membership" of any organized Branch is closed. It shall be declared void if application for a Permanent Charter is not prayed for within one year after the granting thereof.

Section 5. Permanent Charters: The Executive Board shall grant a Permanent Charter upon the written application of a Branch that has been working under a Temporary Charter for at least three (3) months. No Charter shall be granted to more than one Branch in any one city.

Article VIII. Official Publications

Section 1. The Monthly Review: This Society shall publish The Monthly Review which shall contain articles pertaining to the object of the Society, changes in its membership, news of the organization and its members and of the industry in general, and any other information that may be of value to the readers. Each member of the Society in good standing shall receive a copy of The Monthly Review at one-half the regular subscription price which shall be a part of his annual dues.

Section 2. Proceedings: Each Member in good standing shall receive a copy of the *Proceedings* of the Convention. One copy of the Annual Business Meeting Report shall be sent to each Branch Secretary.

Section 3. Release of Papers: The papers presented before the Society and their discussions shall be the property of the Society and may be released to other journals in accordance with the By-Laws. Those read before the Branches shall remain the property of the author to dispose of as he wishes except that he shall allow printing and distribution to the membership of the local Branch before which the paper was read. In no case shall such paper be published in The Monthly Review without the author's consent.

PART II. BRANCHES

Section 1. Names: Each Branch shall be known as the Branch of the Electroplaters' Society of the city or cities in which the Branch is located.

Section 2. Branches shall elect their officers and committees, and may make any rules for their government not inconsistent with the Constitution and the By-Laws of the Society.

Section 3. Any Branch may receive donations or bequests and may expend or invest the same in the interest of said Branch at the discretion of its members or governing body.

Section 4. Local Branches may assess dues, and raise or collect funds to be expended for local purposes, and may have the entire management and control of expenditures of said funds.

Section 5. Branches shall be chartered on the basis of whole counties and include no counties at least some part of which does not lie within a radius of 75 miles from headquarters. Both headquarters and territory are subject to approval of the Executive Board and any change in territory of the Branches already chartered shall be made only by the Executive Board. In the event that a Charter is prayed for by two or more groups residing within a radius of 75 miles, such Branches may be authorized by the Executive Board.

Section 6. Stationery and Literature: All Branch Societies shall use special forms of application blanks, membership cards and certificates, copies of the Constitution, and such other literature as may be designated by the Executive Board, which must be purchased from the Society.

PART III. REVISION OF CONSTITUTION

Article 1. Revision

Section 1. Authority: No part of the Constitution shall be repealed, altered, annulled, suspended or amended except by a two-third referendum vote of all the members voting This vote may be at an Annual Meeting or by letter ballot

Section 2. Amendments: All amendments

shall be submitted to the Executive Board and shall be published in two successive issues of THE MONTHLY REVIEW prior to action.

Section 3. Procedure for Referendum Vote: No referendum vote shall be made unless prayed for by at least 100 members in good standing, no more than 25% of whom shall be members of any one Branch.

ARTICLE II. PARLIAMENTARY AUTHORITY

Section 1. Basis: Roberts' Rules of Order shall be the parliamentary authority for all matters of procedure not especially covered by the Constitution and By-Laws of this Society or by special rules of procedure adopted by the Society.

PART IV. EFFECTIVE DATE OF CONSTITUTION

Section 1. This Constitution shall become effective during the year of its adoption. The officers of that year shall be elected by the delegates according to the present Constitution.

BY-LAWS

PART I. THE SOCIETY

ARTICLE I. ELECTION OF OFFICERS

Section 1. Prior to January 15, the Executive Board shall appoint a Nominating Committee of five members, no two of whom shall be members of a single Branch, and not more than two of whom may be Officers of the Society, who shall send to the Executive Secretary prior to February 15 their nominations of two or more candidates for each office to be filled in the Society, after having notified each candidate of his selection and having received his acceptance.

Section 2. The Executive Secretary shall mail to every Member in good standing on or before March 1, a ballot containing the names of all candidates thus nominated. The voting need not be restricted to the nominees on the ballot. Voting shall be by secret letter ballot; the voter shall sign his name on an outside envelope, and the ballots shall be enclosed in an inner sealed and unmarked envelope.

Voting ballots must reach the Executive Secretary before the first day of May.

Section 3. Prior to May 1, the Executive Board shall appoint three tellers and three alternates, none of whom shall be members of the Executive Board or members of the Nominating Committee or Nominees for office.

Section 4. The tellers shall meet as soon after the first day of May as possible. The Executive Secretary shall deliver to the tellers all ballots received, marking the outside envelopes received from members not entitled to vote because of non-payment of dues. The tellers shall open only the envelopes not thus marked, and shall proceed in secret to count the ballots received. All ballots and unopened envelopes shall be returned to the Executive Secretary who shall preserve them until the Annual Meeting. The Executive Secretary shall return to the senders all rejected envelopes and shall open all unidentified envelopes. The tellers shall prepare and sign a report of the results of the vote, which shall be sealed and shall remain in the possession of one of the tellers selected by them for that purpose, who shall hand this report to the presiding officer at the ensuing Annual Meeting. The presiding officer shall then cause this report to be read, and shall declare duly elected the eligible persons receiving the greatest number of votes for the respective offices.

Section 5. Installation of officers shall take place at the Annual Convention.

ARTICLE II. DUTIES OF OFFICERS

Section 1. Reports: Each officer of this Society shall make a report of his activities to the Annual Convention.

Section 2. President: It shall be the duty of the President to preside at all meetings of the Society, to preserve order, to put all motions before the meeting if duly seconded, to decide all questions of order subject to an appeal to the meeting, to give the deciding vote in case of a tie. He shall be Chairman of the Executive Board. In honor of his office he shall be a member of all committees. He shall call all special meetings of the Society and all meetings of

the Executive Board that may be necessary, at such places as shall be most convenient to the members, and shall state in writing the object of each meeting. He shall appoint all committees not otherwise provided for; in the absence of an officer, appoint a member to act during his absence, and when an officer resigns or dies, appoint with the approval of the Executive Board, a qualified member to fill out the unexpired term.

Section 3. First Vice-President: It shall be the duty of the First Vice-President to perform the duties of the President in the absence, death or resignation of the latter. He shall be a member of the Educational Committee.

Section 4. Second Vice-President: It shall be the duty of the Second Vice-President to perform the duties of the President in the absence of the President and the First Vice-President. He shall be a member of the Membership Committee.

Section 5. Third Vice-President: The Third Vice-President shall perform the duties of the First and Second Vice-Presidents in case of enforced absence or resignation of either of these officers and shall exercise authority in case of absence of the President, First and Second Vice-Presidents. He shall be a member of the Exhibits Committee

Section 6. Executive Board: The Executive Board shall consider and act upon all matters specifically assigned to it in this Constitution or By-Laws, and such other matters as may be referred to it by the President or the Society. It shall engage the services of an auditor for the examination of the books of the Society.

Section 7. Executive Secretary: It shall be the duty of the Executive Secretary to keep an accurate report of the proceedings of each meeting of the Society and of each meeting of the Executive Board. He shall take charge of all funds of the Society, deposit the funds in such a manner as the Executive Board may direct, and pay all bills properly presented to him for payment with the approval of the Treasurer. He shall receive all money paid in by the members and give receipts therefor. He shall keep an itemized record of all receipts and expenditures, and shall have his accounts audited by a Public Accountant and ready for inspection at each Annual Meeting, or at any time the Executive Board may deem advisable. He shall take charge of and preserve in good condition all papers sent to him by any member of the Society, and attend to the editing and publishing of such matter as the Executive Board may direct. He shall be the Managing Editor of THE MONTHLY REVIEW, the *Proceedings* and of the Convention program. He shall deposit the funds received from advertising in the MONTHLY REVIEW, *Proceedings* and any other publication of the Society in the Publications Fund. He shall have power to appoint members of an Editorial Staff. He shall take charge of all literature belonging to the Society. He shall make such exchange of publications with other journals, institutions or societies as may be approved by the Executive Board. He shall attend to the copyrighting of THE MONTHLY REVIEW, *Proceedings* of each Annual Meeting and all other publications of the Society. He may release papers presented at the Annual Meeting for publication in other journals, with appropriate credit, only after their publication in THE MONTHLY REVIEW and/or the annual *Proceedings*, and release such papers that are not published by the Society at such time as he considers advisable, with the approval of the Executive Board. He shall distribute THE MONTHLY REVIEW to all members of the Society. His salary shall be fixed by the Executive Board and included in the Annual Budget submitted by it. All salaries and expenses shall be paid from the General Fund unless otherwise approved by the Executive Board. He shall furnish the bonds required by the Executive Board. He shall be an ex-officio member of the General Committee for each Annual Convention and shall have the accounts of Conventions audited. He shall be the secretary of the Research Committee and an ex-officio member of the Finance Committee.

Section 8. Treasurer: The Treasurer shall sign all vouchers for expenditures of money by the Society. He shall report to the Annual Meeting on the condition of the

finances of the Society and make such recommendations as will in his opinion tend to safeguard or improve same.

Article III. Committees

Section 1. Appointment: As soon as feasible after his election, the President shall appoint all necessary committees not otherwise provided for. One of the Vice-Presidents shall be appointed a member of each one of the standing committees. Those relating to the Annual Convention shall be announced at the first business meeting of the Convention. Unless otherwise stated, all members of these committees must be members of the Society.

Article IV Duties of Committees

Section 1. Law Committee: The Law Committee shall be composed of the Past-Presidents of the Society. The most recent Past-President shall serve as Chairman. The Committee may appoint one of its members secretary for the next ensuing year. This committee shall receive a copy of all amendments and revisions of the Constitution and By-Laws and see that they are properly worded and classified.

Section 2. (a) *Convention Program Committee:* The Program Committee for each Convention shall consist of members of the Branch holding the Convention and the Executive Secretary of the Society. At least two months before the Convention, they shall submit to the Executive Board for its approval a report on the plans for the Convention, including any proposed exhibits.

(b) *Registration Fee:* The registration fee of the Convention shall be determined by the Branch sponsoring the Convention, subject to the approval of the Executive Board.

(c) *Profits of the Convention:* All moneys collected in connection with a convention by any means whatsoever are to be applied against actual expenses of said convention. Any profit accruing after all expenses have been paid is to be divided 50% to the Branch holding the convention and 50% to the General Fund of the Society.

Section 3. The Budget Committee: The Budget Committee shall consist of the Executive Board. It shall submit to the Annual Meeting of the Society a budget of the estimated receipts and expenditures for the ensuing year. After this or an amended budget has been approved for the Society, no expenditures for any items shall be increased by more than twenty (20) per cent without the approval by letter ballot of the Executive Board. If at any time the receipts are less than those estimated, the Executive Board shall endeavor to decrease the expenditures accordingly.

Section 4. Research Committee: (a) The Research Committee shall consist of nine persons who are members of the Society, the Executive Secretary, and one representative from any other technical society that may be approved by the Executive Board. Of the original appointees from the Society, three will serve for a three-year period, three for two years and three for one year. Three new members will thereafter be appointed each year for a term of three years, but no member shall be appointed to the Committee for morethan two consecutive terms. The Committee shall elect one of its members Chairman who shall serve for a term of one year. No person shall serve as Chairman of the Committee for more than two consecutive terms. This Committee is authorized to solicit funds for research from Branches, persons, firms and organizations. (b) Such funds shall be held in custody by the Executive Secretary of the Society and disbursed with the approval of the Chairman and the Treasurer, and the duly appointed subcommittee of disbursements. (c) The Research Committee shall submit to the Executive Board its general plans for any proposed research, including such cooperation with other societies or institutions as is deemed expedient. When such a project is approved by the Executive Board, the Research Committee is authorized to make the necessary detailed arrangements, including the employment of personnel, and publications and distribution of the results; directly, through sub-committees, or through proper representation on joint committees. (d) The Chairman shall call a meeting of

the committee during the Annual Convention and at least one other time in each fiscal year. A summary report shall be made to the Society at each Annual Convention.

Section 5. Membership Committee: The Executive Board shall appoint as the Membership Committee a group consisting of a member selected by each Branch. A member of the Society not affiliated with a Branch may also be a member of this Committee. A Vice-President of the Society shall be a member of this Committee. This Committee shall take such steps as it deems advisable to retain and increase the membership of the Society.

Section 6. Educational Committee: The Executive Board shall appoint the Educational Committee, which shall include the Librarian or any other member of each Branch. A Vice-President of the Society shall be a member of this Committee. This Committee shall assist Branches in improving their educational sessions by securing speakers, programs, classes and teachers for such meetings.

Section 7. Exhibits Committee: The Executive Board shall appoint the members of the Exhibits Committee, who shall be members of one or more Branches including that in the city in which the Convention is to be held. A Vice-President of the Society shall be a member of this Committee. This Committee shall arrange for and have charge of exhibits of electroplating, the finishing of metals and workmanship by members that shall be held in connection with any Annual Convention, and shall make awards of such prizes as may have been offered and approved by the Executive Board. Exhibitions of manufacturers' products are to be held at the discretion and under the direction of the Executive Board.

Section 8. Committee on Papers' Awards: The President shall appoint before each Convention the Chairman and members of the Committee on Papers' Awards. This Committee shall be governed by permanent rules on Paper Awards which are to be a part of these By-Laws. Any changes or departures from these rules shall be effected by application of the Committee Chairman for approval by the Executive Board at least one year in advance to their becoming effective. Any change in the rules to be made shall automatically become a part of the permanent rules. The Committee shall make selections for such awards and announce its decisions during the Annual Convention or as soon thereafter as practicable.

Section 9. Finance Committee: The Executive Board shall appoint the members of the Finance Committee whose duties shall be to obtain Sustaining Members. At least one member of this Committee shall be a member of the Research Committee.

Article V. Funds

Section 1. General Funds: All income of the Society other than that hereinafter specified shall be kept in the General Fund.

Section 2. Publications Fund: All income from publications including advertising income and income from sale of all publications shall be kept in the Publications Fund.

Section 3. Research Fund: All income received from Sustaining Memberships and other funds especially designated in the By-Laws therefor shall be kept in the Research Fund.

Section 4. Special Funds: All funds collected for special purposes shall be kept by the Executive Secretary in separate accounts and shall not be used except for the specified purpose, except by vote of the Executive Board.

Section 5. The Executive Board has the right to divert in emergencies any Funds, except the Research Fund, for the support of the Society.

PART II. REVISION OF BY-LAWS

Article I. Revision

Section 1. Authority: No part of the By-Laws shall be repealed, altered, annulled, suspended or amended except by a two-third referendum vote of all the members voting. This vote may be at an Annual Meeting or by letter ballot.

Section 2. Amendments: All amendments shall be submitted to the Executive Board and shall be published in two successive

publications of THE MONTHLY REVIEW prior to action.

Section 3. Procedure for Referendum Vote: No referendum vote shall be made unless prayed for by at least 100 members in good standing, no more than 25% of whom shall be members of any one Branch.

PAPER AWARDS

I The Committee on Paper Awards shall consist of not less than three nor more than five members and shall be separate and distinct from the Committee on Exhibit Awards. No two members of the committee shall be members of any one Branch. The Chairman of the Committee shall be appointed by the President of the Society within sixty days from the adjournment of the Annual Convention. The other members of the Committee are to be appointed by the President from a panel submitted by the Chairman. This panel shall contain the names of not less than twice the number of members to be appointed.

II. *The following paper awards are to be made:*

A. THE HERMINIE DOROTHEA PROCTOR AWARD of $100.00 is to be made to any person for the best paper presented during a contest year at the Annual Convention. This award is given by Charles H. Proctor, Founder of the Society, in memory of the late Mrs. Herminie Dorothea Proctor.

B. THE FOUNDER'S GOLD MEDAL is to be given as the prize for the best paper presented during a contest year at the Annual Convention by a member of the Society. However, if the winner of award A is a member, award B will go to the member who is next in line for award A.

C. An award of $50.00 is to be given for the best paper printed in THE MONTHLY REVIEW during a contest year. The author may be any person, not necessarily a member of the Society.

D. THE ELECTROPLATERS' SOCIETY GOLD MEDAL is to be given to a member for the best paper printed during a contest year in THE MONTHLY REVIEW. However, if the winner of award C is a member, award D will go to the member who is next in line for award C

E. THE SAMUEL HEUNERFAUTH CUP is to be given for the best paper presented by a Branch and published during the contest year in THE MONTHLY REVIEW or presented during the contest year at the Annual Convention. To be considered a Branch paper, at least five members of the Branch shall have participated in the preparation of the paper, and the librarians of the several Branches shall advise the Chairman of the Paper Awards Committee of those papers which are to be considered as Branch papers and, therefore, eligible for this award.

III. *General Considerations for Award*

A. The "contest year" shall be from the close of one Annual Convention to the close of the Convention in the year for which the award is made. Papers presented at a Branch in one contest year, but printed in THE MONTHLY REVIEW of the following year, shall be classified in the year in which they are printed in THE MONTHLY REVIEW.

B. It is preferable, but not mandatory, that papers to be considered shall be:

(1) Preprinted 30 days in advance of the Annual Convention, or

(2) Submitted to the Committee in triplicate 30 days in advance of the Annual Convention.

C. In judging a paper for an award, there shall be complete disregard of the author's affiliation, e. g., whether he be a Research Associate, or an employee of a company which may benefit from the publication, etc.

D. Papers which have received prior presentation, before other Societies or prior publication outside the publications of the E. S., shall be considered ineligible for competition. This shall include a re-write of such papers, unless the re-write shall contain new material in which case the new material shall be eligible for consideration.

IV. *Specific Considerations for Award*

A. Immediate value to the electroplating or metal finishing industry . . . 30. This shall be measured by such considerations as:

(1) Its money-saving worth in pointing out economies in existing processes

(2) Improvement on existing processes

(3) Simplification of control of process

or of measurement of quality of product

(4) Novel theoretical considerations leading to a more complete understanding of processes

(5) New processes for an existing product

(6) New products.

B. Scientific value.....20
This classification is intended to reward papers having a long-time future value, although they might be of small immediate practical value. A paper may receive a high rating under both A and B.

C. Originality of subject matter, or value as a review paper.....20
A paper which is purely a review paper shall be rated as such on the basis of whether the review was of sufficient scope and was so presented as to be of considerable value to a large number of members.

D. Clarity of presentation.....30
The principal emphasis should be on presentation of subject matter in a clear, understandable manner. Extensive plots, photomicrographs, etc., do not necessarily add to clarity of presentation. The length of the manuscript shall be considered immaterial.

V. *Announcement of paper awards shall be made during the last business session of the Annual Convention, and winners of awards shall be requested in advance to be present.*

EXHIBIT AWARDS

I. The Committee on Exhibit Awards shall consist of five members and shall be separate and distinct from the Committee on Paper Awards. The member of the Branch who is in charge of receiving exhibits shall be a member of this Committee. The Vice-Chairman shall submit a panel of six names to the President of the Society, who shall appoint the other three members of this Committee; except that the Vice-President and members of the Branch in charge of receiving exhibits may be members of the same Branch, no two members of the Committee shall be members of any one Branch.

II. *The following exhibit awards are to be made:*

A. The Metal Finishing Cup shall be the first or highest award for a Branch exhibit.

B. First, second and third paper awards are to be given for the individual exhibits.

III. *Secret or patented processes*

The question of considering exhibits finished by use of secret or patented solutions or processes shall be left primarily to the discretion of the Committee. As a suggestion, the use of any generally known bright nickel bath covered by patents or on which patents are pending, or of a bright copper bath in a similar situation, shall not preclude consideration. On the other hand, a situation wherein the technique employed is *completely obscure* should deprive an exhibit of consideration. Fundamentally, the exhibits are for the purpose of giving practical information about the art of plating and as a measure of the individual skill of those submitting exhibits.

IV. *In considering exhibits, they shall be rated as follows:*

A. The general make-up of the exhibit considering appearance, attractiveness, and artistic motive.....10

B. The overall practical value of the finishes employed on the individual items making up the exhibit.....20

C. Special skill or originality required in the preparation of any or all items in any one exhibit.....20

D. Quality of finish as indicated by freedom from defects, such as pits, poor polishing, poor coverage in the case of plated and buffed articles.....10

E. Disclosure of new or improved processes or sequence of operations which make for decreased cost or improvement in product, and as such are of value to industry.....30

F. Efforts used in preparation, scope of processes covered, and number of members contributing. Proportion of branch membership contributing shall be considered in case of a stalemate.....10

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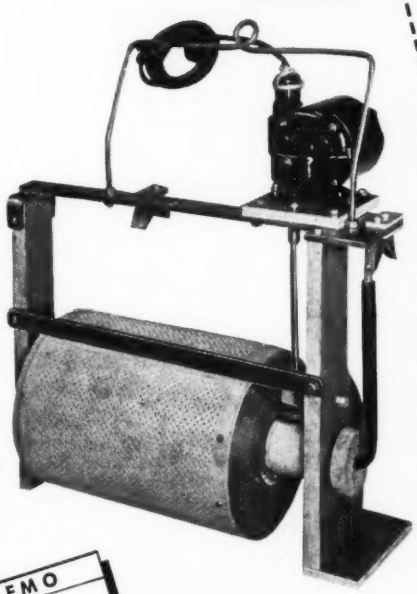

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The Plating Plant Explosion in Los Angeles

According to the Los Angeles *Times* of February 22, a mixture of perchloric acid and acetic anhydride caused the violent blast at the O'Connor Electroplating Company* of Los Angeles, Calif., resulting in:

15 persons killed
151 persons injured
36 dwellings rendered unsafe
200 persons made homeless
1 to 2 million dollars estimated damage
A crater through four inches of concrete 7 to 8 feet deep and some 15 feet in diameter

During the last ten years P. Jacquet and others have recommended mixtures of perchloric acid and acetic anhydride (*in small quantities*) for electrolytic polishing of alloys of steel, lead, tin and aluminum for metallographic examination. More recently the Carpenter Steel Company has suggested a similar mixture for electrolytic polishing of stainless steel articles.

The explosive hazards of acetic anhydride and perchloric acid mixtures are indicated in a bulletin of the G. Frederick Smith Chemical Company, Columbus, Ohio, from which we quote in part. Acetic anhydride "is inflammable". When it "is mixed with 60 to 65 per cent perhcloric acid it reverts to acetic acid and converts the perchloric acid...to approximately 90 per cent strength". The boiling point of the mixture is "approximately 120° C".

"Acetic acid contains combustible material. Perchloric acid will support combustion. The temperature at which perchloric acid becomes a supporter of combustion is in the region of 160° C and this at 72 per cent acid concentration . . .".

"All chemicals are hazardous if not correctly used. Some are poisonous, some are corrosive, some are inflammable or support combustion. The perchlorates are no exception to the rule. They are poisonous, corrosive, support combustion and have been used for explosives."

Numerous perchloric acid or perchlorate explosions have been reported in the literature. Chemists are fully aware of the hazards of these chemicals. Rigid precautions must be taken in their use which is best limited to very small quantities.

We emphatically do not recommend the use of perchlorate chemicals for electropolishing or electroplating operations in metal finishing plants because the quantities must of necessity be dangerously large and it is impossible to guarantee (1) elimination of the explosive hazard resulting from contact with grease, dirt, clothing, wood or organic matter and (2) the infallability of cooling systems and controls.

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*None of the fatalities are known to be members of the American Electroplaters Society, nor were employees of the O'Connor Plating Company known to be members of the Society.

Corrections in "Determination of Impurities in Electroplatinp Solutions" V. Manganese in Nickel Plating Baths

Dr. Serfass, the senior author of the above mentioned report, has made certain corrections which were received too late foi insertion in the report as published in the March issue. They are as follows:

In line 2, column 2, page 320: add after "zinc"—"silica, copper"

In line 17, column 2, page 323: write mg/l instead of ml/l

In line 13, column 2, page 325: substitute "blank" for "periodate"

In line 21, column 1, page 326: insert "to the blank" after "added".

The caption for Fig. 1 should read "Calibration curve for the determination of manganese in a Watts type nickel bath by oxidation with sodium periodate. Instrument used: Klett-Sommerson Colorimeter with green filter No. 54. Type of cell: test tube. Final volume of solution: 100 ml".

The caption for Fig. 2 should read "Extinction vs. wave length for (A) sodium permanganate with 500 micrograms manganese in 100 ml, (B) Klett-Sommerson filter No. 54 (extinction units on the right)".

ADDRESSES DESIRED

We are anxious to obtain the addresses of the following members. Their copies of THE MONTHLY REVIEW have been returned to us with such notes as "not here", "wrong address", and "unclaimed".

Please run through the list! If you find the name of a friend whose new address you know, drop a post card to Box 168, Jenkintown, Pa. It will be much appreciated.

BALTIMORE-WASHINGTON BRANCH
- Roy E. Cole, 904 Virginia Ave. S. E., Washington, D. C.
- Gilman L. Parater, Jr., R. R. D. 5, Anacostia Station, D. C.

BOSTON BRANCH
- William Jones, 12 Chesbrough Rd., W. Roxbury 32, Mass.
- Bernard Olsen, 17 Highland St., Revere 51, Mass.
- John C. Rich, 282 Benifit St., Providence, R. I.

BRIDGEPORT BRANCH
- Carl Mathkowski, 46 Waverly Place, Bridgeport, Conn.
- Eugene P. Schimmel, 27 William St., East Portchester, Conn.

CHICAGO BRANCH
- J. L. Mullen, 1729 O St., Lincoln, Neb.
- E. Woodmansee, 645 N. Clark St., Chicago 10, Ill.

CINCINNATI BRANCH
- Frank P. Lester, 953 Goss Road, Cincinnati 29, Ohio

DETROIT BRANCH
- Ray Hanson, 8902 Chalfonte, Detroit 21, Mich.
- M. C. Marshall, 15850 Rutherford, Detroit 27, Mich.
- D. Thomas Stanton, Jr., P. O. Box 2803, Detroit 31, Mich.
- Kenneth E. Wall, 5049 Mildred, Wayne, Mich.

GRAND RAPIDS BRANCH
- John D. Jakle, 1320 Cherry Lawn St., Detroit 4, Mich.
- Leo P. Waite, 414 Hoffman St., Fort Wayne, Ind.

JACKSON-LANSING BRANCH
- B. E. Howard, R. D. 1, Lake Fenton, Fenton, Mich.
- G. H. Williamson, 1721 S. Muirland, Detroit 21, Mich.

INDIANAPOLIS BRANCH
- Ira K. Fuller, 403 S. West St., Tipton, Ind.

NEWARK BRANCH
- George C. Arnold, 3 Ellis Ave., Newark, N. J.

NEW YORK BRANCH
- Sigmund Katz, c/o Commar Products Corp., 40 Thomas St., Newark, N. J
- Louis Reed, 700 Yuma St. S. E., Washington, D. C.
- Nils P. Wikner, c/o Magnuson Products Corp., 50 Court St., Brooklyn 2, N. Y.

PITTSBURGH BRANCH
- Edward Canaga, c/o DuPont de Nemours & Co., 351 5th Ave., Pittsburgh 22, Pa.

PROVIDENCE-ATTLEBORO BRANCH
- John Gullesarian, 80 Smith St., Providence, R. I.

ROCHESTER BRANCH
- Kenneth Merrill, 45 Exchange St., Rochester, N. Y.

ROCKFORD BRANCH
- Thorleil Lee, Russell Bussall Ward Bolt & Nut Co., Rock Falls, Ill.

(*Continued on page 462*)

GLUE SHORTAGE QUIZ

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Plating On Aluminum

R. A. EHRHARDT and J. M. GUTHRIE

Bell Telephone Laboratories, Inc. Fidelity Chemical Products Company

Aluminum, because of its light weight, is a desirable material for the construction of electrical and other equipment especially for airborne use. Although aluminum can be very satisfactorily protected from corrosion by anodizing, it is sometimes desirable to finish it with another metal.

Applications

The electrical contact resistance of the naturally formed aluminum oxide surface is high and if good contact is required between adjacent parts which cannot be welded, a plated coating of LOW CONTACT RESISTANCE is necessary.

For high frequency apparatus, silver is desirable because of its LOW RESISTANCE TO HIGH FREQUENCY CURRENTS. Since these currents travel in the surface of the conductor, silver-plated aluminum is used where weight is a factor.

Some aluminum details require fabrication by SOLDERING with soft solder. Outstanding examples are the sealing of apparatus containing parts such as Rochelle Salt crystals which cannot stand elevated temperatures, and the fabrication of complex shapes. It can readily be affected by copper plating and soldering. In order to avoid a copper-aluminum couple with its attendant corrosion hazard, the copper is usually stripped from the rest of the surface after soldering. This can easily be accomplished in a chromic-sulfuric acid strip which removes the copper without attacking the solder or the aluminum.

Aluminum can also be brass plated for BONDING IT TO RUBBER, chromium plated for RESISTANCE TO WEAR OR TO ALKALIES, or zinc plated to PREVENT the SEIZING of threaded parts.

Prior Work

Aluminum is a very active metal, high in the electromotive series, and will displace most other metals from solution. Consequently, when placed in a plating solution, the aluminum displaces the plating metal. The usual result is a non-adherent film. Because of this phenomenon, direct plating on aluminum is limited to chromium plating under special conditions and to zinc plating from special baths. These methods are quite practical on relatively pure aluminum (high purity aluminum can be plated directly in a regular zinc bath), but on the alloys satisfactory results are not obtained.

Early attempts to secure adherent deposits on aluminum depended upon the anchoring of the deposit to rough cavities produced in the surface by sand blasting or chemical roughening. The most successful of these methods, published by H. K. Work[1] in 1929, consisted in etching the aluminum in acid solutions of metallic salts. A pitted surface was obtained to which the subsequent plate became anchored by interlocking. The deposits were fairly adherent but rough. The treatments were extremely difficult to control. Different treatments were required for different alloys.

The next commercially successful development is interesting in that it depends upon the oxidation of the aluminum surface rather than upon the removal of all oxide films. Travers[2] found that if the aluminum was suitably oxidized and the oxide coating subsequently modified in a chemical dip, plating would proceed through the pores of the coating and an adherent deposit would be obtained. Fisher[3] recommended a similar process. These processes produce excellent bond, but require a spe-

cial power supply and special temperature controls. In some cases, the modification treatment is critical, particularly in the recesses of articles where the oxide coating is non-uniform. Anodizing can be used as a preparatory step for plating in some cyanide solutions, but best results are obtained when nearly neutral solutions are employed.

Non-adherent metal films produced by chemical displacement are a source of poor adhesion not only to aluminum but also to other metals (i. e., copper deposited on iron by immersion in copper sulfate solutions, silver plated on more active metals without the use of a strike), but if the conditions of displacement can be properly controlled, adherent deposits can be obtained. Zinc, being close to aluminum in the electromotive series, is best suited for the production of an adherent deposit on aluminum, although tin has been successfully deposited on aluminum pistons by chemical deposition and even gold can be deposited by this means. Zincate solutions seem to be the most suitable, probably because the ionization of zinc is suppressed in the highly alkaline solutions. Hewittson[4] developed a zincate solution containing starch as an added ingredient and Korpiun[5] a zincate solution containing cuprous cyanide.

Zincate Pre-treatment

Since it was felt most desirable to use in our work a method that could be easily installed and would require no special plating solutions or techniques, this investigation was limited to a study of the zincate solutions.

Testing Adhesion

One of our main purposes for plating on aluminum is to prepare it for soldering with soft solder. A soldering test was devised to measure the degree of adhesion attained. The 1" x 4" x 1/16" specimens were milled on the long 4 inch edge—which became the soldered edge of the final test specimens—in order to obtain a flat surface. The specimens were then processed and plated. After plating they were cut into ⅛" x 1" strips perpendicular to the long edge. The deposit was removed from the two long faces of the strip with fine emery paper leaving a 1/16" x ⅛" plated area on the ends. One of the ends was then "tinned" with 50:50 lead-tin solder and the strip soldered to the end of a similar copper strip which had been "tinned" on the end only, the sides of the copper pieces having been chromium plated.

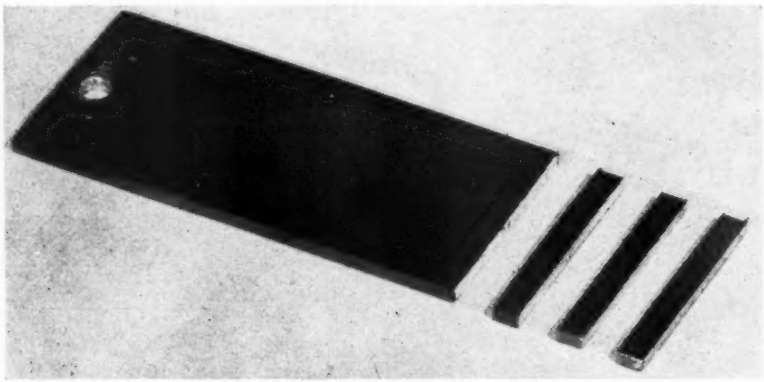

Fig. 1. Steps in the preparation of specimens for adhesion test

Figure 1 shows the steps in the preparation of test specimens. The large piece on the left is a test specimen as cut from the plated piece. The next specimen has had both of the long faces treated with emery paper to remove the copper plate, and the last specimen has been "tinned" on the end with 50:50 lead-tin solder. The soldering operation was done in a metal jig which held the strips in alignment during soldering and subsequent cooling.

Figure 2 shows the test specimens in the

jig preparatory to soldering on an electric hot plate.

The soldered assemblies were mounted in a pair of jaws having swivel connectors. Figure 3 shows the soldered joint adjusted in the test clamps and also the jig used to eliminate strains during clamping. The assembly was tested in a Schopper Tensile Test Machine (Fig. 4) with a capacity of 70 pounds.

After the joints had been broken, the aluminum piece was tested to see if it would resolder in order to determine if the joint had failed in the solder or in the bond between the copper and the aluminum.

Joints between copper specimens of the same size broke at 70 pounds or 9,000 psi.

Aluminum Alloys Studied

The aluminum alloys were as follows:

No. 2S—Commercially pure aluminum
No. 24S—4.5% Cu, 1.25% M_2
No. 43 —5.0% Si
No. 52S—2.5% Mg, 0.25% Cr

Test Procedure

In the initial tests, we used the zincate solution described by Korpiun (this zincate is being marketed commercially).

The test panels were cleaned and etched by immersion in an 8 oz/gal Pennsalt No. 2 cleaner at 200° F. for 30 to 60 seconds, followed by a 1:1 nitric acid dip, the only exception being the No. 43 alloy which was

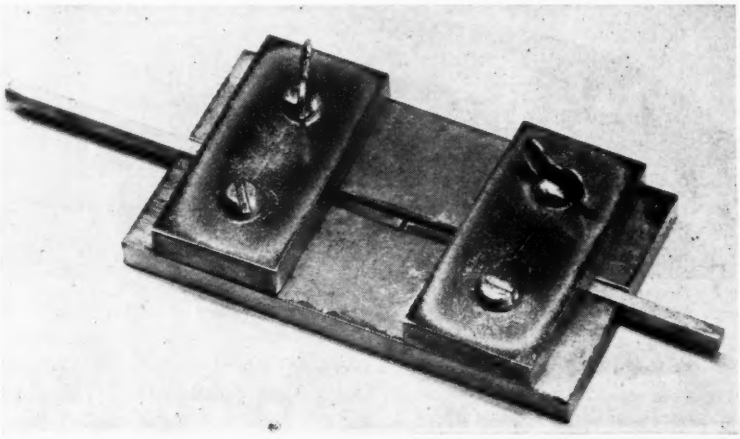

Fig. 2. Adhesion test specimens in soldering jig

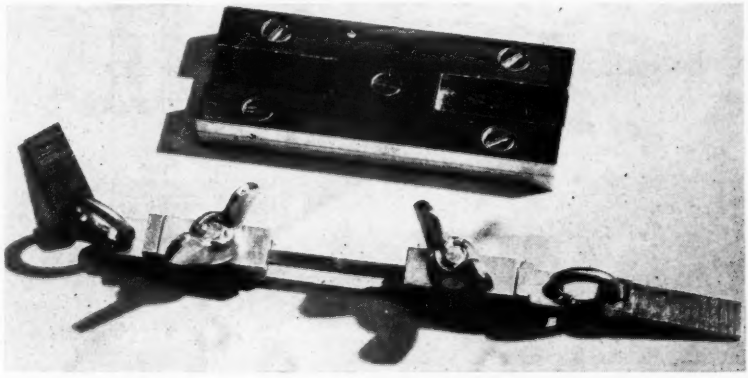

Fig. 3. Soldered specimen in test clamps with clamping jig (above)

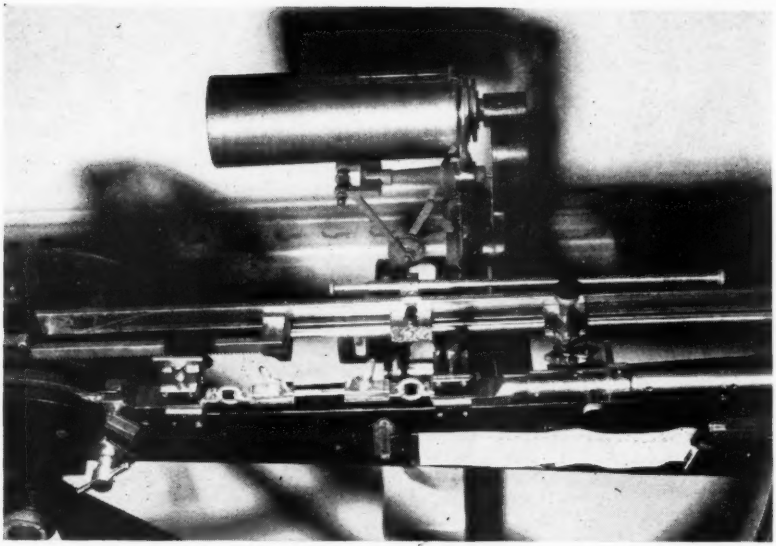

Fig. 4. Schopper Tensile Test Machine

dipped in 10 to 15% hydrofluoric acid prior to the 1:1 nitric acid dip. The specimens were then immersed in the zincate solution for various lengths of time and plated in a Rochelle copper bath at 2 asf and 120° F. long enough to deposit 0.0002 inch of copper. After plating, the panels were cut into test strips, and the soldered joints were made. Ten joints were tested for each condition and the broken joints were tested to determine the location of the failure.

Test Results

In the tests with No. 2S and No. 24S aluminum, the TIME OF IMMERSION IN THE ZINCATE SOLUTION varied between 10 and 300 seconds. As shown in Fig. 5, adhe-

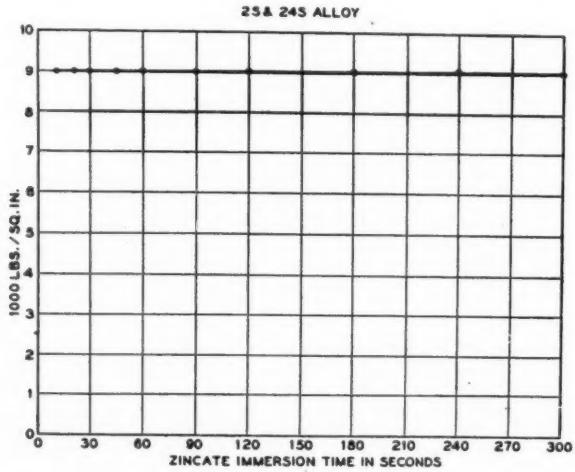

Fig. 5. Effect of time of immersion in zincate solution on strength of No. 2S and No. 24S alloy specimens

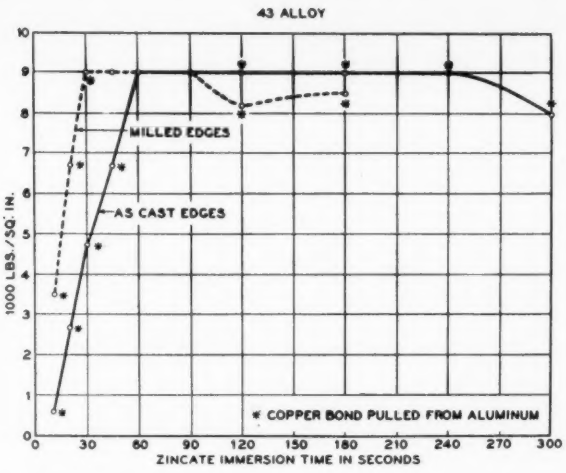

Fig. 6. Effect of time of immersion in zincate solution on strength of No. 43 alloy specimens

sion was satisfactory in all cases, the break occurring in the soldered joint which indicates adhesion of the basis metal to the plate higher than 9,000 psi.

With No. 43 which is a casting alloy, it is necessary to plate on machined or as-cast surfaces. Specimens were made which would represent both conditions. As stated previously, the specimens received a dip of 10 to 15 seconds' duration in a 10 to 15% hydrofluoric acid solution following the alkali dip and prior to the nitric acid dip. With milled edges, the adhesive strength was above the breaking strength of the solder joint when the immersion time in the zincate solution was kept between 30 and 90 seconds. The adhesion of copper to the as-cast edges was satisfactory with between 60 and 240 seconds' immersion. However, in most cases, the surfaces were difficult to resolder (Fig. 6).

The effect on the No. 43 alloy of varying

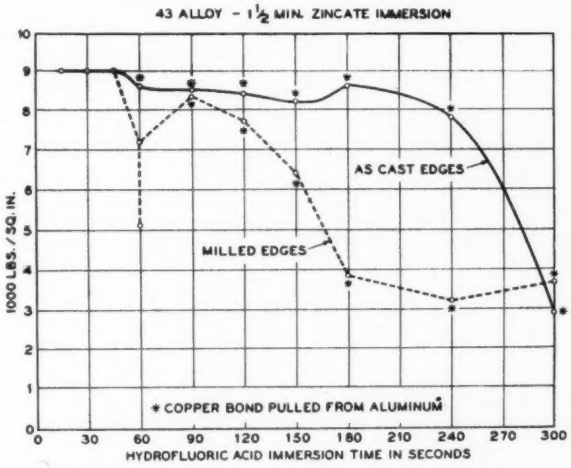

Fig. 7. Effect of time of immersion in hydrofluoric acid on strength of No. 43 alloy specimens

the TIME OF IMMERSION IN A 10 TO 15% HYDROFLUORIC ACID SOLUTION with a constant immersion time of 90 seconds in the zincate solution, was then determined. From 15 to 45 seconds produced satisfactory results on both milled and as-cast surfaces. Longer immersions produced lower adhesion, particularly on specimens with milled edges (Fig. 7). It is obvious from these curves that a short immersion time of from 15 to 20 seconds is necessary in order that satisfactory adhesion be obtained.

While No. 52S alloy gave good adhesion with zincate immersion periods of from 10 to 90 seconds (Fig. 8), DIFFICULTY WITH BLISTERING was encountered even when the tests showed no marked difference in the adhesion.

This is interesting in that blistering is usually considered to be a sign of poor adhesion and, conversely, lack of blistering, a sign of good adhesion. Actually blistering is caused by a combination of fair to poor adhesion and the presence of gas in the base metal or in the base metal-coating interface. Since the nickel bath is nearly 100% efficient, little gas is generated and blistering is absent, but the adhesion is not improved when this alloy is plated. High current densities in the copper bath result in low efficiencies and gassing, consequently a susceptibility to blistering develops. Blistering

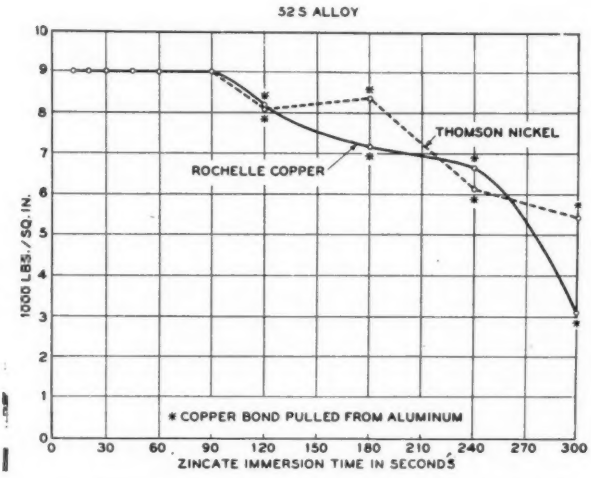

Fig. 8. Effect of time of immersion in zincate solution on strength of No. 52S alloy specimens

adhesion was satisfactory. The blisters appeared in rows which followed the direction of rolling of the aluminum and seemed to be caused by segregation of the alloying constituents. However, the blistering was quite variable from one lot of alloy to another. It generally developed overnight and could be accelerated by heating the specimens to 200° C. for from one-half to one hour, a method which was used as a test for blistering.

Blistering did not occur on specimens plated in a Thompson nickel bath, but the is also more common with thick than with thin deposits because the latter permit gas to escape more easily. In a number of limited tests, the No. 61S alloy which contains less magnesium and some copper and silicon, did not show blisters when subjected to similar treatments as the 52S alloy.

Substitution of caustic soda for Pennsalt No. 2 and variation of the time of immersion did not affect the formation of blisters. Change in the nitric acid concentration from 10 to 100% did not influence the results, providing the time of immer-

sion was sufficient to remove any smut formed on the surface by the alkali. Silver in the nitric acid, which had dissolved from silver-plated racks, was found to be very detrimental with all alloys.

It was discovered that "DOUBLE DIPPING," e. g., removal of the first zinc deposit with nitric acid, followed by re-treatment in the zincate solution, gave excellent results. Deposits of satisfactory adhesion and free from blisters could be obtained on No. 52S alloy with a duration of the second dip of from 10 to 300 seconds. In this case, neither the time of dipping in the first dip nor its concentration was critical. The latter could be as low as one-eighth of that of the final zincate dip. This treatment also permitted much higher initial current densities to be applied in the cyanide copper bath, as high as 40 asf being successfully employed. The "double dipping" was not a new discovery, being mentioned by both Korpiun[5] and Armstrong.[6]

The nature of the improvement of the bond due to "double dipping" has not been determined. A cross-section of a specimen with copper-nickel over a heavy, 300 seconds, zinc deposit shows the latter to be thickest on areas where blisters occur (Fig. 9). These areas are depressed indicating excessive attack. It is possible that the active material is removed from these areas during the first dip and that the surface, being more uniform during the second dip, then precipitates a sounder and more adherent zinc film. It is also possible that a small amount of the zinc alloys with the aluminum during the first dip and presents a surface with more uniform potential to the second dip.

A study was next undertaken to determine the OPTIMUM COMPOSITION OF THE ZINCATE SOLUTION. Since No. 52S alloy had been the most difficult to process satisfactorily, it was used in these tests with an occasional check on the other alloys. The method of testing for adhesion was changed in the interest of simplicity since we were only interested in obtaining adhesion higher than the breaking strength of solder. A brass rod was soldered perpendicularly to the face of the panel, the joint was broken and tested to determine if it would resolder.

When a solution containing no copper was

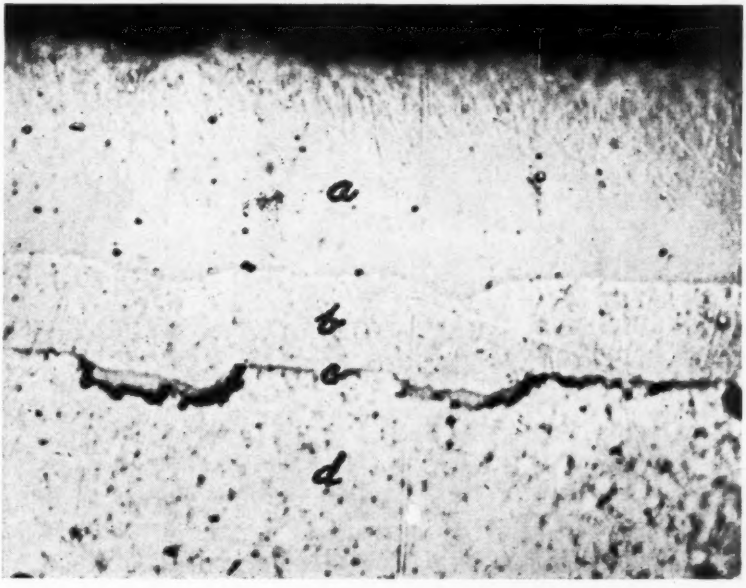

Fig. 9. Photomicrograph of copper-nickel plated aluminum specimen. (a) nickel backing, (b) copper plate, (c) zinc immersion coating, (d) aluminum base. X1500

used, satisfactory adhesion could not be obtained with a single dip, but could be had by "double dipping." Sodium cuprocyanide was added in increasing quantities, and the tests indicated that copper contents of from 3 to 7 g/l were satisfactory, the adhesion being poor when less than 3 g/l were present and only fair with more than 7 g/l. Sodium cyanide additions alone were not beneficial.

Using 4 g/l copper as sodium cuprocyanide, tests were made with different zinc and caustic soda concentrations. For convenience sake, the caustic soda content was estimated by determination of the specific gravity of the solution. With zinc concentrations below 64 g/l and specific gravities below 1.38, blistering appeared when a single dip was used. Zinc concentration above 75 g/l are difficult to reach, and specific gravities above 1.41, although producing satisfactory deposits, are not satisfactory because of precipitation of sludges which may contaminate the work. The recommended composition for plating on all alloys is specific gravity 1.38 to 1.41, zinc 65 to 78 g/l and copper 3 to 7 g/l. The limits for plating on relatively pure aluminum and on copper-containing alloys are wider and less critical than those required for No. 52S alloy.

Miscellaneous Notes

CLEANING seems to be the most important step in preparing aluminum for plating by the zincate process, and many cleaning processes remain to be tried. Bengston[7] who used a zincate solution containing no copper favored a hot sulfuric-chromic acid dip. Attempts to use this dip on No. 52S alloy in combination with the copper bearing zincate solution gave unsatisfactory results. The commercially pure aluminum, No. 2S and No. 3S, and the copper bearing alloys seem to be very easily handled by the zincate process without any other treatment than the regular mild alkali etch followed by the nitric or nitric-sulfuric acid dip

As is common with most aluminum treating, ALUMINUM RACKS AND WIRES should be used for contact purposes. Zinc can be used, but it does not stand up well in nitric acid solutions.

Special plating baths are not required. Korpiun[5] mentions additions to the plating baths, but these have not been found necessary.

No difficulty has been experienced with recessed parts and work has been processed successfully in both basket and barrel.

The zincate solution is easy to CONTROL since most of the loss is by dragout. The analysis is not complicated because both zinc and copper can be determined electrolytically and the caustic soda content can be controlled by specific gravity.

Because of the simplicity of processing and use of common plating solutions this process was used successfully on airborne communications equipment in several plating shops.

CORROSION TESTS on plated aluminum indicate, as would be expected, that corrosion is greatly accelerated unless the coatings are absolutely pore free. With zinc and cadmium coatings which give slight protection, corrosion is less, but the corrosion resistance is still extremely low compared with the excellent results obtained by anodizing any aluminum alloy. While plated aluminum articles would be satisfactory for indoor use and could be used outdoors with heavier deposits, in general, it is not recommended that aluminum be plated unless the plated coating is necessary for some reason other than corrosion protection.

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A SURFACE ACTIVE AGENT for the Cleaning of Metals

O. M. MORGAN

NEW PRODUCTS DIVISION, NATIONAL ANILINE DIVISION
ALLIED CHEMICAL & DYE CORPORATION—BUFFALO, N. Y.

Summary

A SYNTHETIC organic detergent of the alkyl aryl sodium sulphonate type, sold under the trade-mark "Nacconol NR," is shown to cause a definite improvement in the metal cleaning efficacies of alkalis and acids. (See also U. S. patent 2,314,285.) Through the use of this product, treatment time, operating temperatures and concentrations of chemicals can be reduced. Its cleaning ability is not affected by the hardness of the water.

A new quantitative method has been developed for the evaluation of metal cleaning compounds. Since mineral oil fluoresces brightly under ultraviolet light and fluorescence is capable of being photographed, a convenient means is provided for the detection and recording of oil residues on metal surfaces both before and after cleaning.

Introduction

The cleaning of metal surfaces has for many years been accomplished by the use of alkaline and acid solutions. Their popularity is founded on ow unit cost, widespread distribution and easy availability, as well as on versatility in removing undesirable films from metal surfaces without requiring mechanical scrubbing action.

Alkalis are highly reactive chemically and may clean metals by saponifying the surface oils. The cleaning action may also be associated with their ability to disperse water-insoluble oils. Certain types of metal may be cleaned by etching of the surface. Etching is an important preparatory step in many metal processing operations and is well illustrated in the alkaline etching of aluminum surfaces prior to welding or painting. The cleaning action of acids on metals is largely caused by their ability to etch the metal surface or to dissolve oxide films. Acids have little or no emulsifying power and, therefore, if a cleaning action is required in acid solutions, means must be found to impart emulsifying properties.

The purpose of the present work was to determine the scientific and commercial importance of a surface active agent in the removal of oil films from metal surfaces. Its cleaning action is studied in conjunction with alkalis and acids as well as by itself.

Since alkaline cleaners remove practically all mineral oil from a metal surface without mechanical scrubbing, it is obvious that any improvement must be limited to an acceleration of the removal of oil to the removal of the last traces of oil.

In order accurately to determine and record the residual traces of oil on metal, it was found necessary to develop a new analytical method which would show the presence of oil residues and their distribution.

By means of the new analytical method it was possible to show that the use of a surface active agent with alkaline cleaners did indeed make possible the removal of traces of oil which are often left by ordinary alkaline cleaning processes.

The cleaning of metals has been carefully studied in the laboratory and the improved laboratory results obtained with the surface active agent have been correlated with and

confirmed in plant practice in a large number of commercial establishments.

The surface active agent is known by the trade-mark Nacconol NR. Most surface active agents which are stable under cleaning bath conditions are beneficial in varying degrees in metal cleaning processes. The organic content of Nacconol NR is mainly alkyl aryl sodium sulfonates having a long alkyl chain and, with that constitution, it is completely stable in alkaline or acid cleaning baths.

Among surface active agents, synthetic detergents are more useful than wetting agents because they (1) give the cleansing bath a longer life and (2) may be used in very low concentrations. Nacconol NR also has a definite metal cleaning capacity in its own right and can be used effectively with brushing or scrubbing, but where the metal to be cleaned is merely dipped in the cleaning solution, acids or alkalis are advantageously present.

Need for Test

The property of removing oil from metals is recognized relatively easily, but it is difficult to visualize the quantity and distribution of any small amount of oil which may remain after the cleaning. Practically any alkali is capable of removing most of the oil from the metal and unless a quantitative evaluation of the residual oil can be made, the true value of the metal cleaner is left as a matter for conjecture.

A real need existed for an at least semi-quantitative test for the comparison of the residual oil on metals which had been subjected to different cleaning solutions and conditions. This test should be both rapid and capable of providing a permanent record. The measurement of one or several physical or chemical characteristics of an alkaline cleaning solution is not sufficient to establish quantitatively its merit as a cleaning agent. A performance test comprising cleaning of uniformly oiled metal samples and observation of the residual traces of oil was considered most desirable. With this in mind, the following semi-quantitative test method for the evaluation of metal cleaning compounds was evolved. Its application made possible the evaluation of the effect of the addition of the synthetic detergent to metal cleaners.

Testing Method

Mineral oil fluoresces brightly under ultraviolet or "black" light to reflect a visible white. Animal and vegetable oils which do not fluoresce can be made to fluoresce by the addition of an oil soluble fluorescent dyestuff. Since the intensity of the white fluorescence is proportional to the amount of oil present, and since clean metal under ultraviolet light appears black or nearly so, a natural scale of measurement is established. The visible fluorescence is capable of being photographed on an ordinary photographic plate which provides a permanent record of the extent to which the metal is cleaned. By the use of this method fine distinctions can be made between cleaning compounds.

Method of Oiling the Metal

In order to prepare uniformly oiled metal strips for testing, the metal test strips, 2 x 4 inches in size, were scrubbed by hand with a 0.50 per cent solution of Nacconol NR at 110° F, thoroughly rinsed in warm water, rinsed in alcohol and allowed to dry.

Strips of wool flannel 1⅞ x 3⅞ inches were saturated with the oil to be employed in the test. A mineral oil composition such as is used in the rolling of brass has been found very satisfactory. The oil saturated wool strips were alternated with the metal strips to form a stack with oil saturated wool strips and protecting metal plates at top and bottom.

The stack of plates was placed between the jaws of an hydraulic press, the edges of the plates having been carefully squared up. A pressure of 500 psi was applied and maintained until no more oil oozed out, the edges being constantly wiped with a clean cotton cloth. The pressure was then released and the strips removed and retaned in a perfectly horizontal position until taken out of the stack, one at a time, for the cleaning tests. By this method of application, the weight of the oil adhering to the surface of the metal did not vary more than three per cent.

Method of Cleaning

The results referred to in this article

were obtained with straight soak treatments. No mechanical agitation of any kind was injected into the process, although that can be easily arranged when desired. Eight hundred (800) cubic centimeters of the cleaning solution was placed in a 1000 cc beaker. The beaker was immersed in a constant temperature bath of the desired temperature and the test plate was hung in the beaker from a hook for the required period of time. The plate was withdrawn and rinsed in running water of 100° F for 30 seconds and then hung in the air to dry. The plates were finally placed in a rack of such a design that they did not touch each other and kept there until such time as it was possible to photograph a complete series from any given set of experiments.

Method of Recording Results

After cleaning, the metal strips were subjected to ultraviolet light and either examined visually or photographed. A diagram of the arrangement of the apparatus for taking the pictures is presented in Fig. 1.

The lamp used provided a powerful source of ultraviolet light, but any strong source of ultraviolet light that is properly filtered to remove essentially all of the visible spectrum is satisfactory. The ultraviolet radiation was incident to the surface

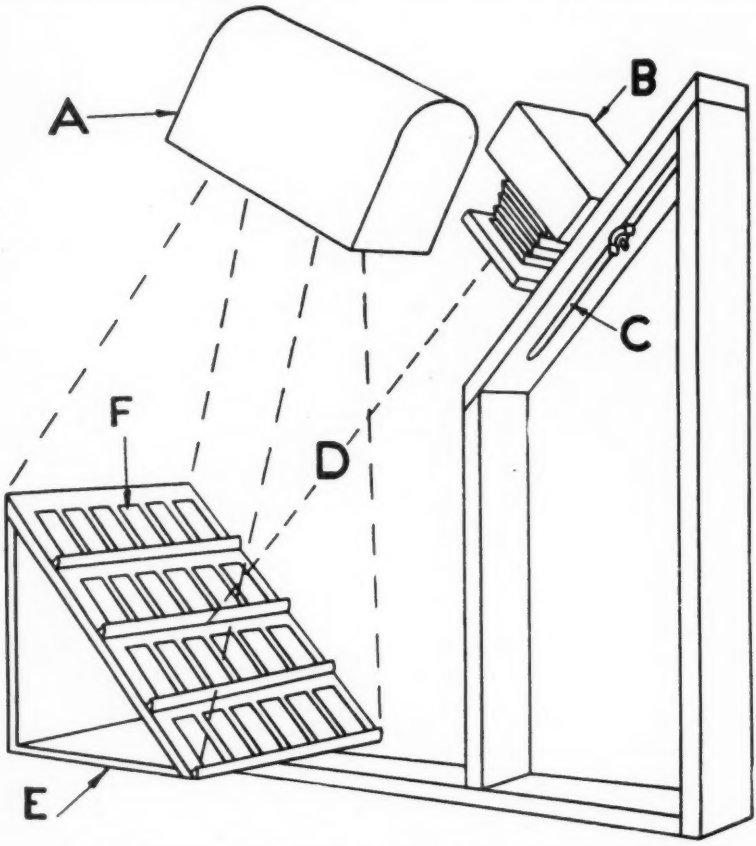

Fig. 1. Photographic arrangements for taking Luminograms. (A) ultraviolet lamp, Hanovia Analytic Model Quarts Lamp; (B) 4 x 5 view camera with Wratten K-2 filter and Tri-X film; (C) slot for camera adjustment; (D) distance from camera lens to easel, about 36 inches; (E) easel; (F) metal strips 4 x 2 inches

of the panels at an angle of 45° with the lamp about 30 inches from the mid-point of the rack.

The pictures were taken at F. 4.5 with a 10-minute exposure. The camera was placed approximately 36 inches from the rack, facing it directly. The film developer used in this work was DK-60A which is designed to give maximum contrast. Temperature and developing time were carefully controlled in the development of both films and prints. Otherwise no special precautions were taken. The pictures made under ultraviolet light are referred to as Luminograms.

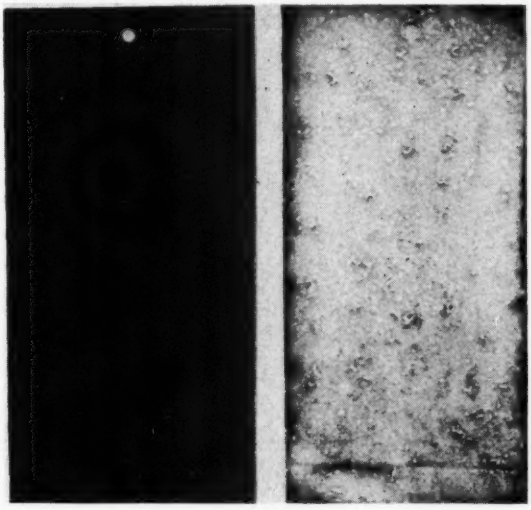

Fig. 2. Appearance of clean steel (left) and steel treated with 1.13×10^{-1} gram oil per square centimeter (right)

Experimental Work

The soaking method of metal cleaning was selected since it is widely used and simple to control in the laboratory. It clearly shows the differences between different types of cleaners. Generally speaking, metal cleaners are effective at much lower concentrations when mechanical action is added in the form of hand scrubbing, electric cleaning or high pressure spraying.

The cleaning experiments were conducted on the following metals:—

Steel—20 gauge cold rolled sheet.

Galvanized Steel—20 gauge hot dip galvanized sheet.

Tin Plated Steel—24 gauge dairy plate.

Aluminum Alloy 3S (1.2 per cent manganese)—20 gauge, mirror finish.

Brass—Soft sheet, 0.032 inch thick, annealed at about 550° C to Rockwell F hardness of 61–62.

For many metal cleaning and etching purposes, it is feasible to use individual alkalis to accomplish a desired result. For most purposes mixtures of alkalis serve these needs more effectively. In order that the evaluation of the surface active agent in alkaline cleaning compounds might be conducted on as simple a basis as possible, single alkalis were generally used in the present work and the results with individual alkalis should not be regarded as representing the effects obtained with mixtures containing the individual alkalis tested.

Experimental Results

The evaluation of Nacconol NR as a metal cleaner and also as a metal cleaning assistant when used in conjunction with alkalis or acids is presented pictorially in Figs. 2 to 11. In Fig. 2 are compared

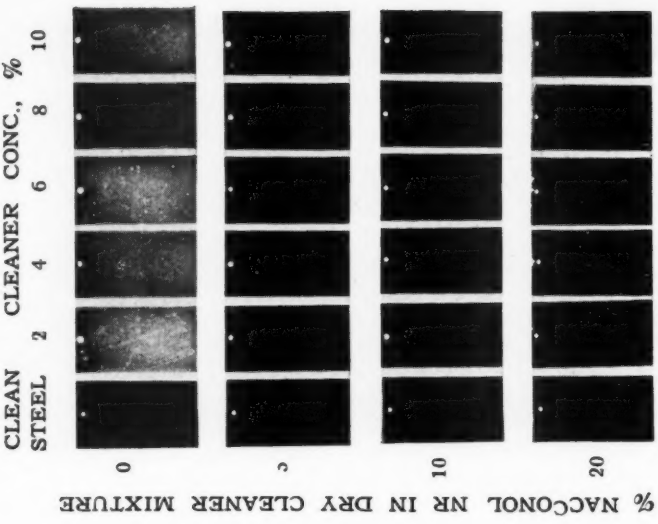

Fig 1. Effect of Cleaner No. 1 (10 per cent caustic soda, 55 per cent trisodium phosphate, 35 per cent soda ash) with varying amounts of Nacconol NR at 140° for 10 minutes on removal of mineral oil from steel

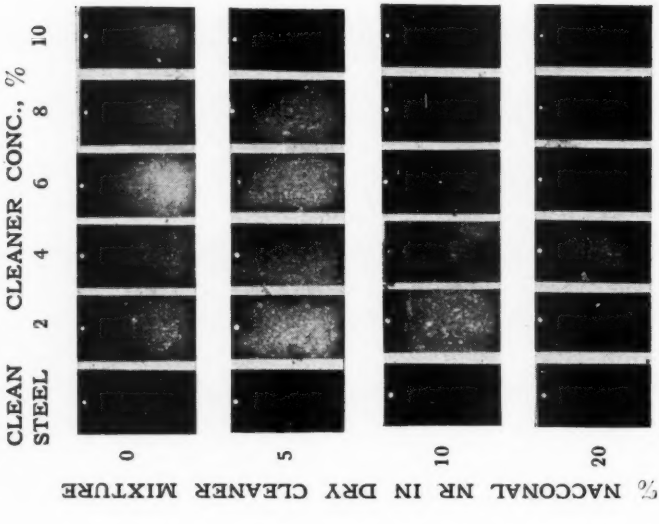

Fig. 3. Effect of caustic soda with varying amounts of Nacconol NR at 140° F for 10 minutes on removal of mineral oil from steel

the appearances of clean and oiled steel when viewed under ultraviolet light. Under the invisible ultraviolet or "black" light, the clean steel appears black while the oiled steel glows with a brilliant fluorescence. This picture illustrates the extremities of the visual scale which are established by this test method.

Figs. 3 to 6 show on one hand the varying efficacy of different alkalis by themselves. At 140° F, the low temperature chosen for all these tests, and 10 minutes time of immersion, none of the alkalis—caustic soda, caustic soda-trisodium phosphate-soda ash, sodium orthosilicate or sodium metasilicate—provide complete oil removal even in concentrations as high as 10 per cent, although sodium metasilicate in this concentration approaches the goal. On the other hand, the figures show the boosting

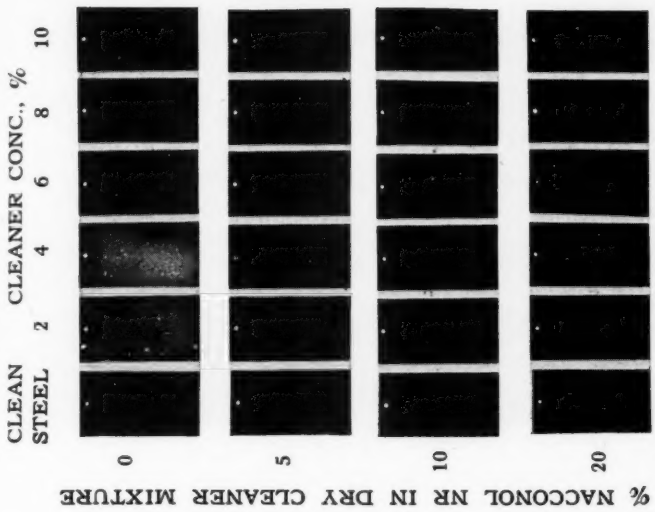

Fig. 6. Effect of sodium metasilicate with varying amounts of Nacconol NR at 140° F for 10 minutes on removal of mineral oil from steel

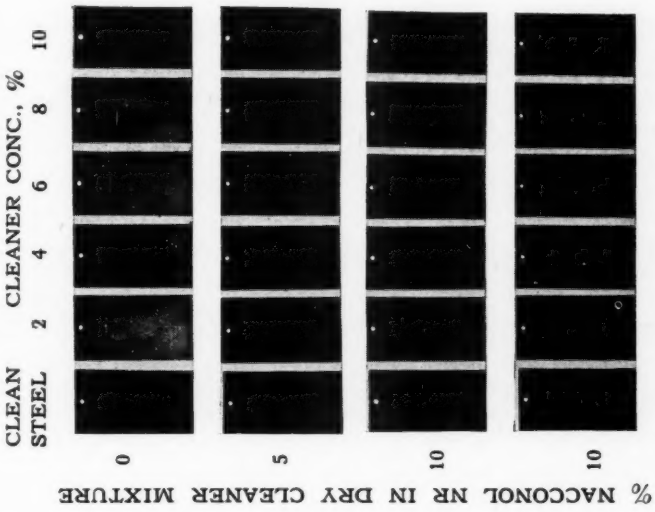

Fig. 5. Effect of sodium orthosilicate with varying amounts of Nacconol NR at 140° F for 10 minutes on removal of mineral oil from steel

effect of Nacconol NR. Except for caustic soda which to be effective in concentrations at 8 per cent or above requires an addition of 20 per cent Nacconol NR, the alkalis in concentrations of 2 per cent and up need only 5 per cent Nacconol before they are capable of removing mineral oil.

Fig. 7 demonstrates that partial removal of mineral oil from steel can be effected through the use of Nacconol NR alone. The addition of sodium metasilicate in amounts of 20 per cent or less allows complete removal when the cleaner concentration in the solution is sufficiently high.

In Figs. 8 and 9 is shown that under hard water conditions a cleaner containing 5 per cent Nacconol NR at 140° F is more efficacious than one containing 5 per cent rosin soap at 180° F. Other work has shown that 10 per cent rosin soap is required to

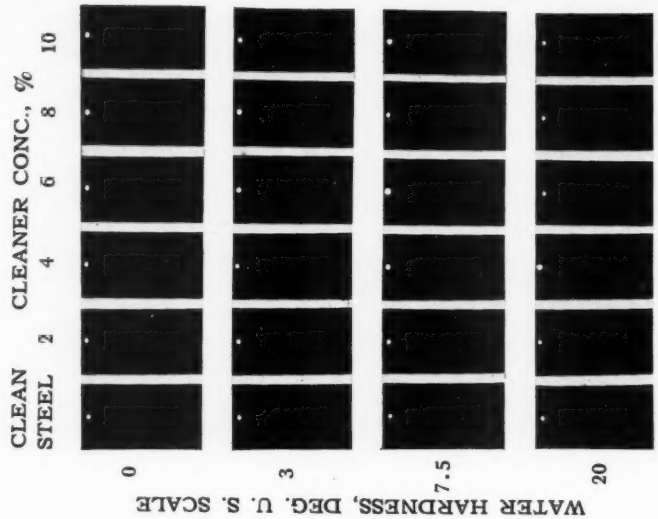

Fig. 8. Effect of water hardness on removal of mineral oil from steel in solutions of 95 per cent Cleaner No. 1 (see Fig. 4) and 5 per cent Nacconol NR at 140° F for 10 minutes

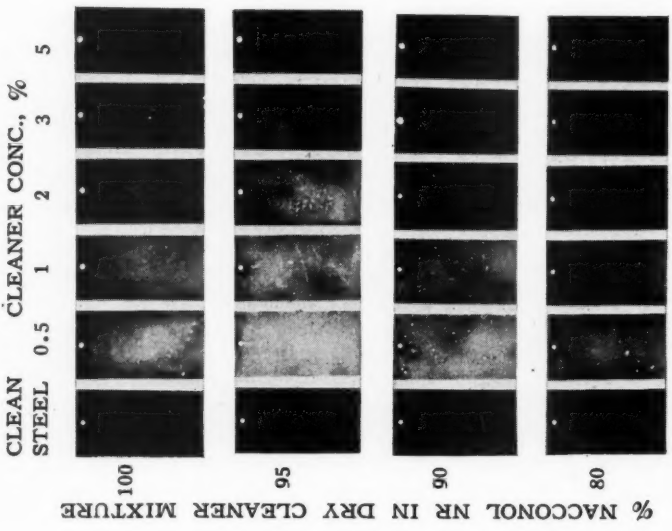

Fig. 7. Effect of Nacconol NR with varying amounts of sodium metasilicate at 140° F for 10 minutes on removal of mineral oil from steel

equal the performance of 5 per cent Nacconol NR. Hard water does not affect the cleaning ability of a compound containing Nacconol NR.

The effects of cleaning time and temperature are clearly demonstrated in Figs. 10 and 11. Three and four per cent solutions of a cleaning compound containing 95 per cent sodium metasilicate and 5 per cent Nacconol NR effect complete removal of mineral oil from steel surfaces in two to four minutes at 140° F. A one per cent solution of this mixture is effective in 8 minutes, but a 4 per cent solution of sodium metasilicate alone is not capable of completely removing the oil in a 10-minute soaking operation.

With a cleaning time of 5 minutes, a 4 per cent solution of the mixture cleans at all the temperatures tested from 120 to

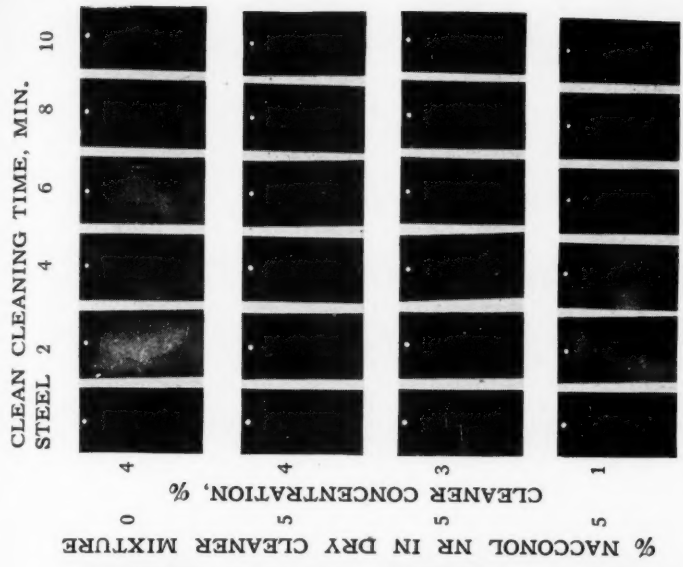

Fig. 10. Effect of cleaning time on removal of mineral oil from steel in socium metasilicate solutions with varying amounts of Nacconol NR at 140° F

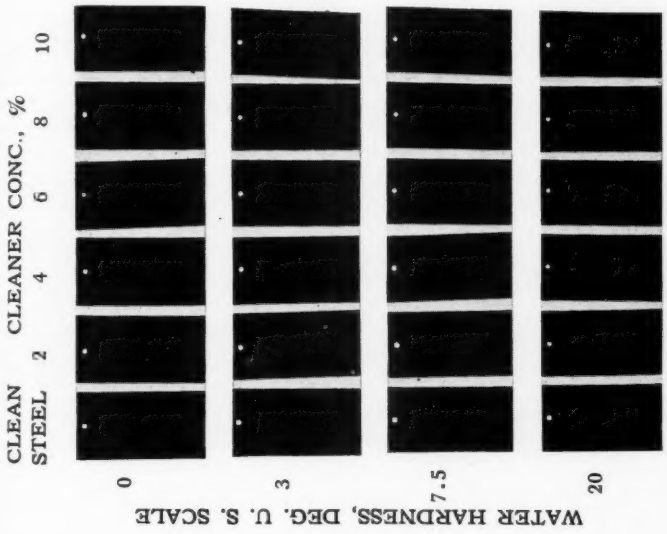

Fig. 9. Effect of water hardness on removal of mineral oil from steel in solutions of 95 per cent Cleaner No. 1. (see Fig 4) and 5 per cent rosin soap at 180° F for 10 minutes

200° F, and a 3 per cent solution at 140° F or higher, while a 1 per cent solution requires a temperature of 200° F, just as the 4 per cent solution of sodium metasilicate alone.

The improved results obtained with the addition of surface active agent to alkalis in the cleaning of galvanized steel, tin-plated steel, brass and aluminum are much the same as those obtained on steel with the exception of the time required to effect complete oil removal. These data are presented in Figure 12 wherein it will be noted that the improvement in the rate of cleaning by Nacconol NR is more pronounced for aluminum and galvanized steel than for steel. The rate of cleaning of brass and tin-plated steel is lower than that of the other metals studied, but it is more rapid than when alkalis are used alone.

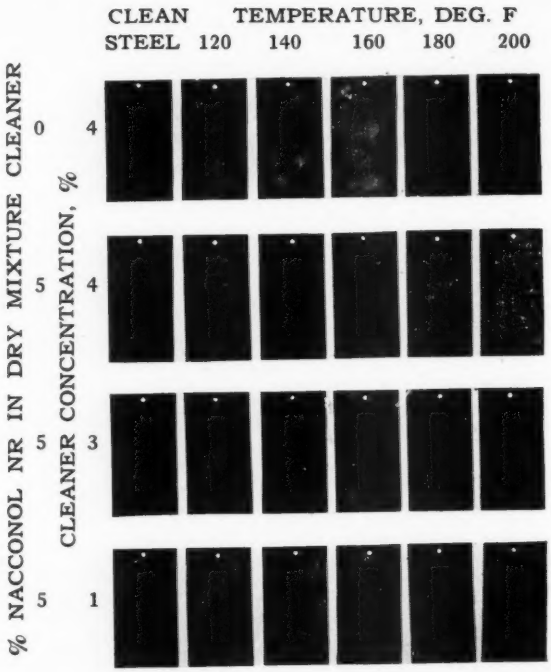

Fig. 11. Effect of cleaner temperature on removal of mineral oil from steel for 10 minutes in solutions of sodium metasilicate with and without 5 per cent Nacconol NR

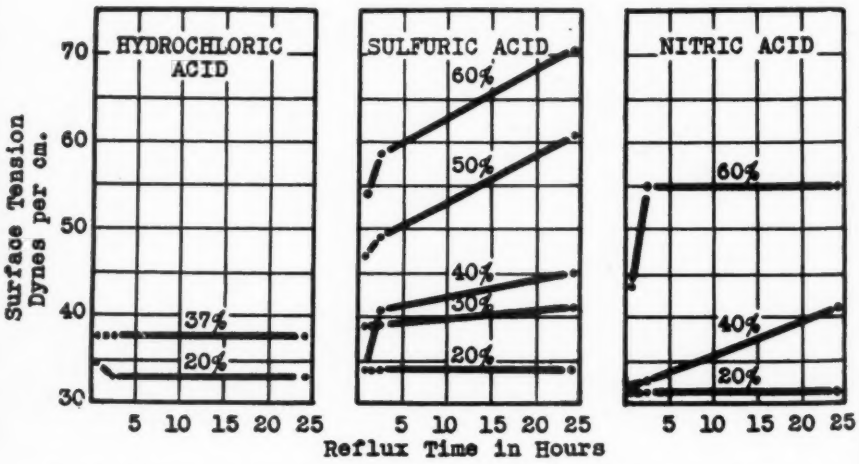

Fig. 13. Effect of time on surface tension of boiling mineral acids to which 0.1 per cent Naccanol had been added

Acid Cleaning of Metal

Up to this point chief emphasis has been placed on the commonly practiced alkaline cleaning of metals and the part played by the synthetic detergent in the improvement of these processes. However, Nacconol NR displays surface active properties in acid solution as well.

Fig. 13 illustrates the stability of Nacconol NR in boiling mineral acids of different concentrations. Since Nacconol NR, even in amounts of less than 0.1 per cent, sharply reduces the surface tension of water, a quantitative estimation of the active detergent in aqueous solution can be based on the determination of surface tension of the liquid with a stalagmometer.

It will be noted in Fig. 13 that Nacconol NR is capable of reducing the surface tension of hot mineral acids in concentrations which are considerably higher than those normally used for metal processing.

Figs. 14, 15 and 16 illustrate the ability of Nacconol NR to improve the cleaning of steel in hot sulfuric, hydrochloric and phosphoric acids respectively. Extended trials under plant conditions have confirmed these results.

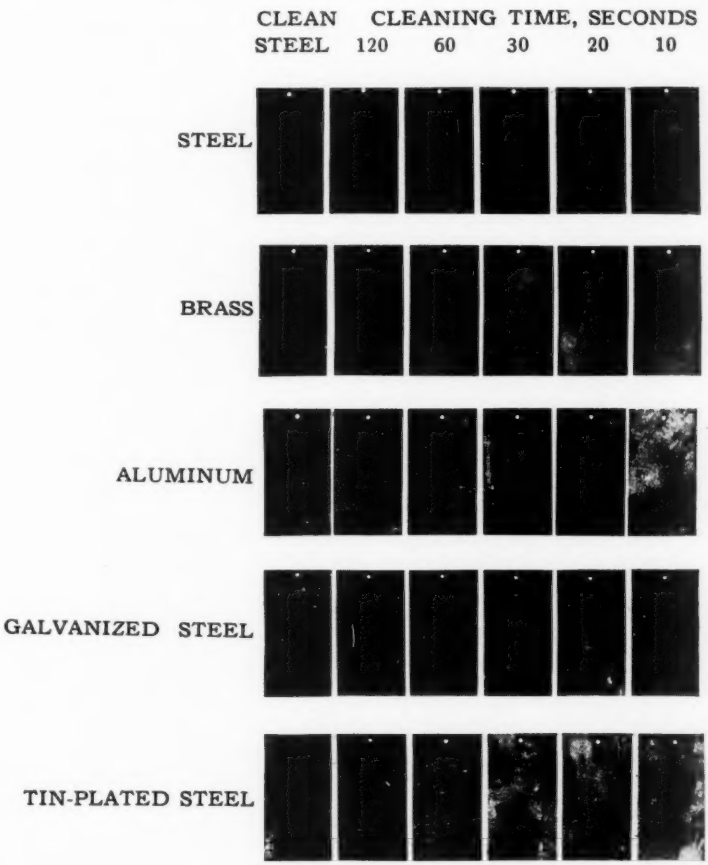

Fig. 12. Effect of cleaning time on oil removal from five metals in 4 per cent solutions of 95 parts sodium metasilicate and 5 parts Nacconol NR at 140° F

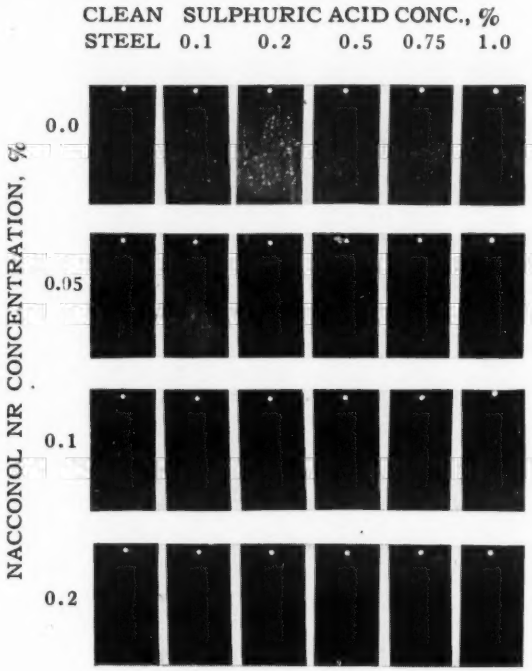

Fig. 14. Effect of concentration of Nacconol NR in sulfuric acid solutions of 160° F on removal of mineral oil from steel in 5 minutes

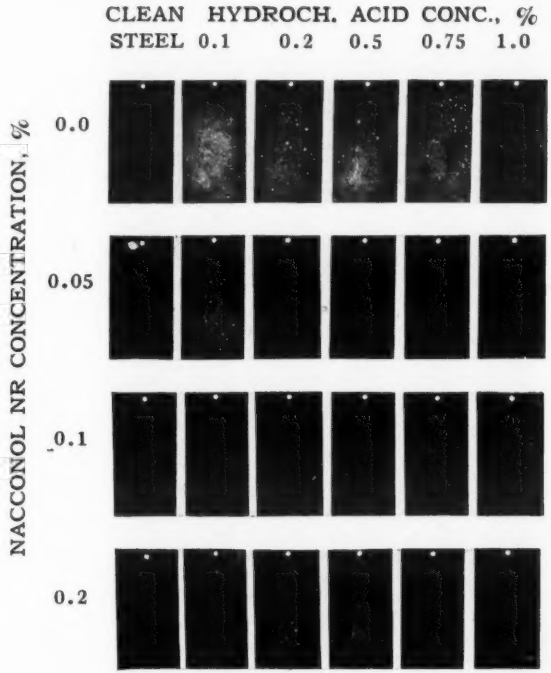

Fig. 15. Effect of concentration of Nacconol NR in hydrochloric acid solutions of 100° F on removal of mineral oil from steel in 5 minutes

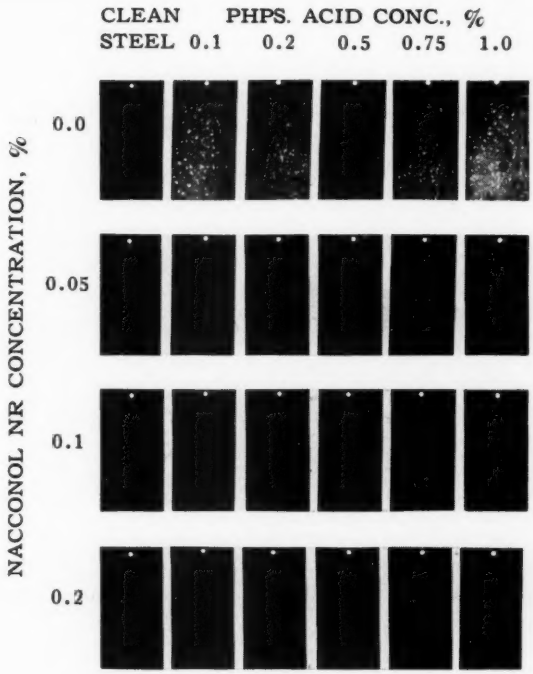

Fig. 16. Effect of concentration of Nacconol NR in phosphoric acid solutions of 180° F on removal of mineral oil from steel in 5 minutes

Acid Etching of Metal

The utility of Nacconol NR in the acid etching of metal has been well demonstrated during the war in connection with the preparation of aluminum surfaces for spot welding. Etching eliminates the uneven aluminum oxide coating and provides surface conditions favorable to the production of a durable welded bond. The high acid stability of the detergent has been largely responsible for its general acceptance for this type of work. It has been demonstrated that a more uniform removal of the aluminum oxide is effected with shorter processing cycles when Nacconol NR is present in the acid etch.

The acid etching of other metals such as iron, steel and brass, is also rendered much more uniform through the use of Nacconol NR. It would appear that this uniformity results from the ability of the synthetic detergent to serve as a cleaner and to provide more rapid and more intimate contact of the acid with the metal surface.

Acknowledgements

The author wishes to express his appreciation to Mr. L. H. Flett for his helpful suggestions in the preparation of this article and to Mr. J. G. Lankler for his work in metal cleaning and the preparation of the photographs.

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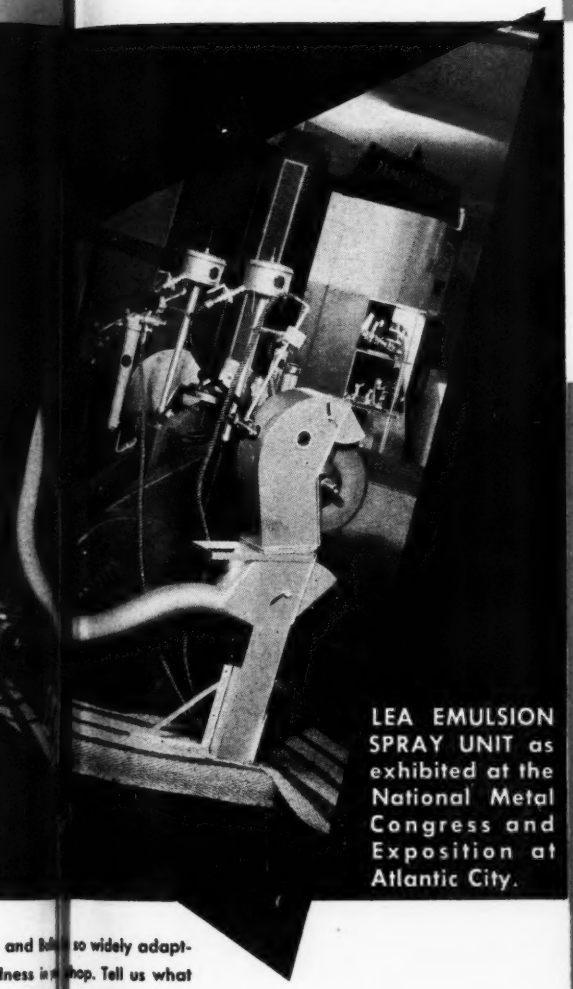

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POROSITY of ELECTRODEPOSITED METALS

A. E. S. Research Project No. 6

1. Bibliography

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Project Director

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Acknowledgment is due the Research Committee, Mr. E. T. Candee, American Brass Company, Chairman; the Research Directing Sub-Committee, Dr. Richard M. Wick, Bethlehem Steel Corporation, and Dr. Louis Weisberg, Consulting Chemist, New York City, Chairman and Vice-Chairman respectively; and the Project Sub-Committee, Dr. W. A. Wesley, The International Nickel Company, Chairman, Dr. B. Egeberg, International Silver Company, and Dr. Robert M. Burns, Bell Telephone Laboratories, Inc., for their contribution to this project.

In compiling a bibliography of literature sources on porosity of electrodeposited metals, we had to contend with a major and fundamental problem of definition and selection.

Strictly speaking, all phenomena of corrosion of the underlying base metal across a metal film electrolytically deposited thereon are linked with and directly indicative of porous structure of the electrodeposited protective metal film. In a broad sense, a bibliography on porosity should logically extend to all work dealing with corrosion underneath electrodeposited metal films, that is, include the thousands of references recording results of the conventional tests for corrodibility of metal-plated metals: atmospheric exposures, immersion—continuous and intermittent—and particularly salt spray tests, even though porosity of the protective film may neither be mentioned nor in any way explicitly looked for.

Such a broad interpretation would obviously be tantamount to a tremendous expansion of the original scope. Inasmuch as the object of Research Project No. 6 is the specific study of the nature and causes of the porosity which seems to be a systematic occurrence in metal electrodeposits, the bibliography of necessity had to be confined to sources which make explicit contributions to that narrowly defined problem. It was, therefore, decided to draw the line rather closely and only to include references which bear directly on the porosity aspect in corrosion. There is no denying, however, that in a great many cases the decision reached as to inclusion or non-inclusion involves a personal equation and some degree of arbitrariness; this is rooted in the very nature of the problem and the insolvable difficulty of drawing a rigid line between explicit investigations of porosity of electrodeposits and the much more numerous investigations of what is a direct manifestation of that porosity—the corrodibility of the electroprotected base metal.

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DETERMINATION OF IMPURITIES IN ELECTROPLATING SOLUTIONS

A. E. S. Research Project No. 2

VI. Traces of Copper In Nickel Plating Baths

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Acknowledgment is due the Research Committee, Mr. E. C. Candee, American Brass Company, Chairman; the Research Directing Sub-Committee, Dr. R. M. Wick, Bethlehem Steel Corporation, and Dr. Louis Weisberg, Consulting Chemist, New York City, Chairman and Vice-Chairman respectively; and the Project Sub-Committee, Dr. D. Gardner Foulke, Hanson-Van Winkle-Munning Company, Chairman, and Dr. Walter R. Meyer, The Enthone Company, for their contribution to this project.

Summary

Copper is isolated from the other constituents in the plating bath by precipitation with 2-mercaptobenzothiazole and extraction of the precipitate with amyl acetate. The color is then developed by addition of dibutyl amine and carbon disulfide. After the solution has been diluted to 25 ml with ethyl alcohol, its transmittancy is measured using a Klett-Sommerson colorimeter with blue filter No. 42.

Introduction

The purpose of this investigation was to develop an analytical procedure for the determination of very small amounts of copper in nickel plating baths. As in previous articles in this series, the method desired was one that would be applicable in the presence of appreciable quantities of other ions, namely chromate, silicate, calcium, aluminum, cadmium, lead, iron (ferric or ferrous), and manganese.

A literature search showed that little work has been done in the past on this subject. Several electrolytic methods have been reported. Pinner, Soderberg, and Baker[17] determined copper in nickel baths in this way. Hills[11] determined copper in cadmium cyanide baths by taking an aliquot of the bath down to fumes of sulfuric acid, adding nitric acid and plating out the copper. Harris[10] determined copper in chromium plating baths by precipitating copper as cupric sulfide, dissolving the sulfide in nitric acid and plating out the copper. Thompson and Thomas[22], working on nickel salts to be used in plating baths, also analyzed for copper by electrodeposition. Knapp[13] separated and determined copper in a nickel plating bath by means of dithizone.

As a colorimetric method was desired, a further search of the chemical literature was made for references pertaining to the usual means employed in separating very small quantities of copper from other constituents

in a solution and for colorimetric procedures that have been developed for copper analysis.

Reliable and quantitative methods for the isolation of traces of copper are not numerous. Precipitation with hydrogen sulfide is apparently satisfactory if the mixture is allowed to stand overnight before filtration[1,6,8]. Sodium diethyl dithiocarbamate, $N(C_2H_5)_2CS_2Na$, will also precipitate small quantities of copper. The resulting compound can be isolated by extracting it with amyl alcohol, amyl acetate, carbon tetrachloride or bromobenzene[7]. Dithizone will extract traces of copper from a slightly acid solution. Electrolytic deposition of the copper is another way to isolate it[9]. An interesting method has also been described by Clarke and Hermance[6]. Filter paper is impregnated with cadmium sulfide and the solution containing the copper filtered through the paper. The copper reacts to form copper sulfide which remains on the paper while cadmium goes into solution.

These methods of isolating small amounts of copper do not comprise all the methods that may give quantitative separations, but only those that are known to give good results with micrograms of copper.

There are many reactions that have been used as a basis for the colorimetric determination of copper. It would be pointless to discuss all of them here. Hence, only a brief summary of the most popular methods will be given.

In the "carbamate" method, the copper is precipitated as copper diethyl dithiocarbamate. If precipitated in the presence of gum arabic, a golden brown suspension is obtained the transmittancy of which is proportional to the copper concentration. If the colloid is omitted, the precipitate formed can be extracted by organic solvents such as those mentioned above and the solution used for the analysis [4,12,7].

In the dithizone method[13,14,2,16], copper is extracted from a solution of an acidity of about 0.05 to 0.1 normal with an accurately measured quantity of dithizone solution, and the transmittancy of the copper dithizonate or the excess dithizone is measured.

For moderate amounts of copper, the ammonia method is widely used, although any other ions that form colored complex ions with copper must be absent[23,20]. The solution is made ammoniacal, and the intensity of the deep blue solution is a measure of the amount of copper present.

When potassium ferrocyanide[23] is added to solutions containing copper ions, a purplish brown color due to the complex salt $Cu_2Fe(CN)_6$ is formed. The intensity of this color is a measure of the quantity of copper present.

For the numerous other methods, the reader is referred to texts by Sandell[18], Yoe[23], Snell and Snell[20], and Mellan[15].

Developmental Work

To decide which reaction to utilize in analyzing for copper in nickel baths was quite a problem. In the "carbamate" method, nickel is also precipitated by the reagent. It is also extracted by the same solvents. Nickel could be removed before the addition of "carbamate" by precipitation with dimethylglyoxime, but some copper might be lost as a result of absorption by the precipitate.

The dithizone method seemed satisfactory because none of the other elements that react with dithizone in acid solution, namely palladium, gold, silver, mercury, and bismuth, were to be present in this investigation. Hence, the copper could be extracted with dithizone solution and the transmittancy of the extract measured as outlined above. However, in attempting to use the method, a number of difficulties were encountered. The calibration curve obtained with a colorimeter was not a straight line, nor did it go through the origin, the point from which the curve started being dependent on the concentration of the dithizone originally used. Considering the possible range of copper in plating baths and the instability of dithizone solution, the method was given no further consideration.

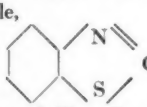
Since the other methods commonly used for the analysis of copper did not appear

TABLE I
Effect of pH on the Precipitation of Copper

*p*H	1.4	2.1	2.6	3.8
Colorimeter Readings	31.0	297	367	368

to offer any more hope of being applicable to the problem than those already discussed, a search for a new method was made.

A reaction that seemed of interest is that between copper ions and 2-mercaptobenzothiazole,



Spacu and Kuras[21], only copper will react with the reagent in an acetic acid solution and extracting the precipitate with amyl acetate, copper can be isolated from the other constituents in the bath.

Since the color intensity of the amyl acetate extract did not vary sufficiently with the copper concentration, it could not be used directly to determine copper. Hence, an attempt was made to develop the copper "carbamate" color in the amyl acetate-copper mercaptobenzothiazole solution inasmuch as copper diethyldithiocarbamate is also soluble in amyl acetate. After many trials, it was found that by adding dibutyl amine and carbon disulfide to the amyl acetate solution, a yellow brown solution was obtained, the color intensity of which did

TABLE II
Calibration Curve Data

Copper Added gamma	Readings	Average Reading	Blank	Corrected Average Reading	Mean Average Reading
10	92–92–91	92	46	46	45
10	89–88–90	89	46	43	
30	175–174–173	174	46	128	
30	172–173–170	172	51	121	127
30	184–185–184	184	51	133	
60	276–272–272	273	38	235	
60	290–290–294	291	46	245	237
60	270–266–270	268	38	230	
100	440–435–445	440	46	394	
100	425–425–425	425	38	387	392
100	440–430–435	435	38	397	

to form an orange-yellow precipitate. Lead, bismuth, mercury, silver, gold, cadmium, and thallium will all form precipitates with the reagent in ammoniacal solution. Since the reagent seemed to be almost specific for copper in slightly acid solution, its use was investigated further. Although Spacu and Kuras used the reagent only in the precipitation of comparatively large quantities of copper, tests indicated that it could definitely precipitate about 50 micrograms of copper in a volume of 25 ml.

Further, the copper mercaptobenzothiazole precipitate is soluble in amyl acetate to form a light yellow solution. Therefore, by precipitating copper with the reagent vary considerably with the amount of copper present.

Effect of pH on the Precipitation of Copper

With a tentative procedure established, a study was made to determine the optimum *p*H at which to precipitate the copper with 2-mercaptobenzothiazole. Table I shows the relation between the *p*H of the solution when the reagent is added and the readings obtained with 100 micrograms of copper present.

These results indicate that the final *p*H of the solution from which the copper is precipitated should be at least 2.6 or higher.

Preparation of the Calibration Curve

To prepare a working curve for the determination of copper by the procedure developed, 5 ml portions of a pure Watts type nickel plating bath were pipetted into each of four 60 ml separatory funnels. Then 10, 30, 60, and 100 micrograms of copper were added successively to the funnels using the standard copper solution described below. The color in these solutions was then developed by following the recommended routine procedure given near the end of this paper.

The data obtained is presented in Table II.

The calibration curve was obtained by plotting the mean average readings in Table II against the corresponding concentrations of copper with the former as the abscissa.

A straight line obtained in Fig. 1 indicates that Bouguer-Beer's law is followed by the colored system over the concentration range tested.

A blue filter, Klett-Sommerson No. 42, was used in getting the data in Table II because the transmittancy curve of the colored system in Fig. 2 shows that its absorption is a maximum when the wave length of the incident light is about 435–440 millimicrons. Fig. 2 also shows the transmittancy curve of the blue filter. It transmits a relatively narrow band of light which is at a maximum for light of about 420 millimicrons. Since it shows maximum transmission for light of nearly the same wave length for which the colored system shows maximum absorption, it is a good filter for the colored system under consideration This means maximum sensitivity, i. e., scale divisions per microgram of copper, and minimum interference due to absorption of light by other substances in the solution. A Beckman spectrophotometer was used in getting the data for the transmittancy curves.

If an instrument possessing a wave length selector is available for the work, the selector should be set at 435 millimicrons.

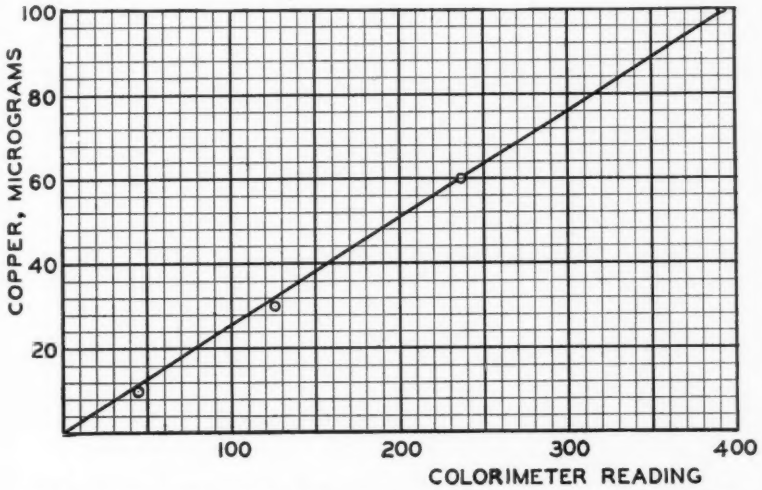


Fig. 1. Calibration curve for the determination of copper in a Watts type nickel bath as copper diethyldithiocarbamate in a mixture of amyl acetate and ethyl alcohol. Instrument used: Klett-Sommerson colorimeter with blue filter No. 42. Type of cell: test tube. Final volume of solution: 25 ml

Determination of the Accuracy and Precision of the Method

To determine the accuracy obtainable with this method under conditions similar

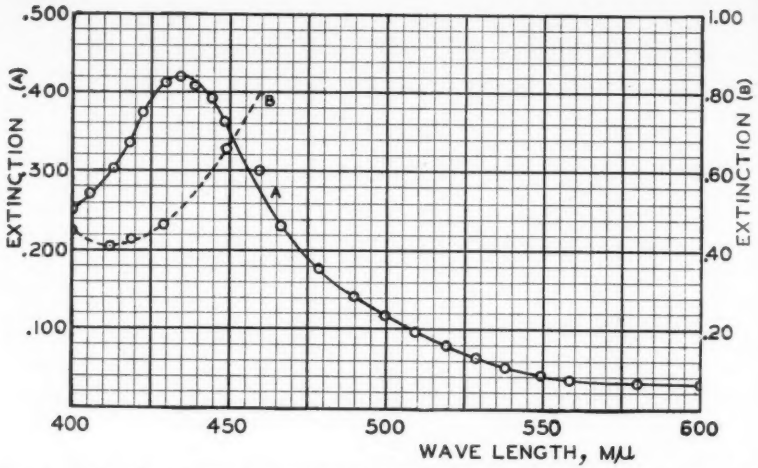


Fig. 2. Extinction vs wave length for (A) copper diethyldithiocarbamate containing 50 micrograms copper in 25 ml, (B) Klett-Sommerson filter No. 42 (extinction units on the right)

to those that are likely to be met in industry, small amounts of various metallic salts were dissolved in 100 ml of the pure synthetic Watts type bath the composition of which is described below. The accuracy of the method was determined in the presence of the "impurities" listed in Table III which also shows the quantity of each that was added to the bath.

TABLE III
Kind and Quantity of Ions Added to the Bath

Ions Added	Quantity mg	Concentration g/l
Aluminum	100	1.0
Cadmium	100	1.0
Chromic Oxide (CrO_3)	20	0.2
Copper	20	0.2
Lead	5.0	0.05
Manganese	100	1.0
Silicon (as Silicate)	100	1.0
Zinc	100	1.0
Calcium	Saturated	Saturated

The foreign ions wherever possible were added to the bath as the solid chlorides, sulfates, or nitrates. All the salts dissolved except the calcium salt. The solution was heated, shaken well, and cooled. It was then filtered through a Whatman No. 40 filter paper to remove the excess calcium salts. The filtrate was used for both the accuracy and the precision tests.

The recommended routine procedure given near the end of this article was followed exactly. Table IV shows the results obtained in checking the accuracy of the method. The figures apply to single runs and not to averages of several.

TABLE IV
Accuracy Test

Copper Added gamma	Readings	Average Reading	Blank	Corrected Average Reading	Copper Recovered gamma
10	91–89–92	91	48	43	10.8
20	134–136–133	134	48	86	21.5
50	248–248–250	249	48	201	50.5
70	315–320–315	317	48	269	68.0
100	420–425–415	420	35	385	96.0

The average accuracy for all the tests is about 5 per cent. It is somewhat greater with the smaller quantities of copper and smaller with the larger quantities. However, all errors are less than 10 per cent.

TABLE V

Results Obtained by Different Laboratories

Laboratory	Copper micrograms/ml
A	10.0
B	10.0
C	12.0
D	10.2

To furnish an additional check on the accuracy that can be attained several commercial laboratories kindly consented to analyze a nickel bath sample containing a known amount of copper using the analytical method described below. These concerns were the Bethlehem Steel Company, Bethlehem, Pa; Foster D. Snell, Inc., Brooklyn, N. Y., and the Research Laboratory of The International Nickel Company, Bayonne, N. J. The bath sample sent out for analysis was the same as that used in the above-mentioned accuracy test to which enough standard copper solution had been added to give it a copper concentration of 10 micrograms per milliliter. The results obtained by these laboratories and the writers are shown in Table V. They agree reasonably well indicating that the method when followed closely will give fairly accurate and reliable results.

To test the precision of the method, four duplicates containing 50 micrograms of copper were run. The results are shown in Table VI.

The precision of the method is $\pm$ 2 per cent. Duplicability of results is equally good for other amounts of copper up to 100 micrograms.

Recommended Routine Procedure

The following procedure was finally adopted for the determination of copper in nickel plating baths.

Reagents Required

1. *Dibutylamine*—purest grade obtainable
2. *Carbon disulfide*—purest grade obtainable
3. *2-Mercaptobenzothiazole solution*—1 per cent

Dissolve one gram of the reagent in 100 ml of ethyl alcohol.

4. *Alcohol, ethyl*—95 per cent
5. *Amyl acetate*—reagent grade
6. *Standard copper solution*—10 micrograms/ml

TABLE VI

Precision of the Method

Copper Added gamma	Readings	Average Reading	Blank	Corrected Average Reading	Copper Found gamma
50	248–248–250	249	48	201	50.5
50	242–246–244	244	48	196	49.0
50	250–246–246	247	48	199	50.0
50	254–250–248	251	48	203	51.0

Dissolve exactly 100 milligrams of pure copper in a 50 ml beaker with 1 ml concentrated nitric acid. Dilute to a liter and mix. Pipette 10 ml of this stock solution into a 100 ml volumetric flask and dilute to the mark with pure distilled water. Each milliliter of this solution contains 10 micrograms of copper.

7. *Synthetic Watts type nickel plating bath*

Dissolve 330 grams $NiSO_4.7H_2O$, 45 grams $NiCl_2.6H_2O$ and 30 grams H_3BO_3 in pure distilled water to make one liter of solution. These reagents should be of A. C. S. grade.

8. *Acetic acid—sodium acetate buffer*—pH = 3.5

Mix 30 ml glacial acetic acid with 60 ml distilled water and add 12 ml 50% sodium acetate (50 g salt in 100 ml solution) to

make approximately 6 N acetic acid.
9. Hydrochloric acid—(1:1)
10. Ammonia—(1:1)

APPARATUS REQUIRED

1. Separatory funnels — short stemmed Squibb type, about 60–100 ml capacity
2. 25 ml volumetric flasks
3. Pipettes
4. 25 ml graduated cylinder
5. Colorimeter or spectrophotometer

A Klett-Sommerson colorimeter with blue filter No. 42 was used in this investigation. Any other colorimeter with any suitable filter or any spectrophotometer can be used.

6. Four dropping bottles or eye droppers
7. 50 ml beakers

PROCEDURE

Isolation of Copper

1. Pipette 5 ml of the plating bath into a separatory funnel and add 5 ml of distilled water.

2. Add 2.0 ml of the acetic acid-sodium acetate buffer.

3. Add 1 ml of the mercaptobenzothiazole solution and shake well for about 30 seconds

4. Add 5 ml of amyl acetate, shake for one minute, then run the aqueous layer into another separatory funnel.

5. Repeat step 4 with another 5 ml of amyl acetate, this time discarding the aqueous layer.

6. Combine the amyl acetate extractions and wash them eight times with 10 ml portions of pure distilled water.

Development of the Colored System

7. Add 5 drops of dibutyl amine and 2 drops of carbon disulfide.

8. Shake well for 30 seconds, then run the solution into a 25 ml volumetric flask.

9. Wash the separatory funnel with a few milliliters of 95% ethyl alcohol and run it into the same flask.

10. Dilute the flask to the mark with the ethyl alcohol. Shake well to mix.

Measurement of Light Absorbed by the Solution

11. Using a test tube partially filled with a 2:3 mixture of amyl acetate and ethyl alcohol as the reference liquid, adjust the colorimeter so that the galvanometer pointer is at the zero position when the dial reading is zero.

12. Pour the solution out of the test tube, rinse it out a couple of times with small portions of the test solution, and then almost fill the tube with the solution.

13. Put the test tube back in the colorimeter and rotate the dial until the galvanometer pointer returns to its zero position. Record the scale reading.

14. Run a blank following the above procedure exactly, except that the additions of the dibutyl amine and carbon disulfide are omitted. Record the scale reading.

15. Subtract the blank reading from the test solution reading to get the corrected measure of the light transmitted by the solution. This method of correcting for the blank is permissible only when the scale readings of the instrument give the extinction of the solution or are related to the extinction, i. e., when the scale is a logarithmic one.

16. Look up the corrected scale reading on the calibration curve. The corresponding amount of copper is the quantity of copper in the volume of the bath originally taken for analysis.

If an instrument with a wave length selector is used, set it at 435 millimicrons for this determination.

CALCULATIONS

Suppose a reading of 350 is obtained when 5 ml of a bath are taken for analysis and that a blank on a similar aliquot gives a reading of 46.

The corrected reading is $350 - 46 = 304$. According to the calibration curve it corresponds to the presence of 76 micrograms of copper in 5 ml of the bath. Therefore, in a liter of the bath there are $76 \times 200 = 15{,}200$ micrograms or 15.2 milligrams of copper. Thus the bath contains 15.2 ppm or 0.0152 g/l copper.

As explained in a previous paper[19], it is possible to eliminate the need for a calibration curve if a colored system is known to

obey Bouguer-Beer's law, and if the instrument measures transmittancy in terms of extinction or in units related to extinction.

One has only to run a standard containing a known quantity of copper, the unknown, and a blank. After correcting the readings of both the standard and the unknown for the blank, the following formula is used to calculate the concentration of copper in the unknown:

$$\frac{\text{concentration of standard}}{\text{corrected standard reading}} \times \text{corrected unknown reading} = \text{concentration of unknown}$$

Discussion of Procedure

The only critical point in the whole procedure is the adjustment of the *p*H of the solution. The aqueous layer that remains following the precipitation and the extraction of the copper *must* have a *p*H of 2.6 or higher. It was found that the *p*H changed by 0.3 to 0.4 units during the precipitation and extraction steps if the solution is not buffered. The buffer brings the *p*H of the solution to about 3.5.

A *p*H of as high as 4.2 will not cause any nickel to be precipitated along with the copper. However, it is best to keep the *p*H below this figure because other elements—iron—may begin to precipitate.

Despite the fact that nickel is not apparently precipitated by the 2-mercaptobenzothiazole at the acidity used, it seems to be very difficult to remove all the nickel from the amyl acetate extractions by washing. Even after eight washings with water, a trace of nickel could still be detected in the last washing. However, the quantity remaining was so small that it could not appreciably affect the results.

"Stop and Go" Method for Copper

For those who are interested in a method that will give approximate results and that does not require a colorimeter, the following is recommended.

Procedure

1. Follow the recommended procedure up to and including step (9).

2. Shake the solution and run it into a graduated 50 ml Nessler tube. Rinse out the funnel with ethyl alcohol and run the washings into the tube. Then dilute the solution with ethyl alcohol to 25 ml.

3. Add to a second Nessler tube 10 ml of amyl acetate, 5 drops of butylamine, 2 drops of carbon disulfide and sufficient ethyl alcohol to make the volume in the tube about 24 ml. Shake well to mix.

4. Now add to the second tube from a microburette, a drop at a time, the standard copper solution which contains 100 micrograms of copper per milliliter.

5. Shake the solution after each drop is added and compare the color of the solution in this tube with that of the unknown in the other tube. View the two tubes horizontally against a white background.

6. Continue steps (4) and (5) until the colors in the two tubes match. Then note the volume of the copper solution added. The amount of copper in the unknown is equal to the amount of copper in the volume of standard solution needed to match the color of the unknown.

Applicability of the Method to Other Types of Nickel Plating Baths

The procedure has been tested on all chloride, 50–50, and high sulfate nickel plating baths as well as on a Watts bath and found to give satisfactory results.

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(Continued from Page 399)

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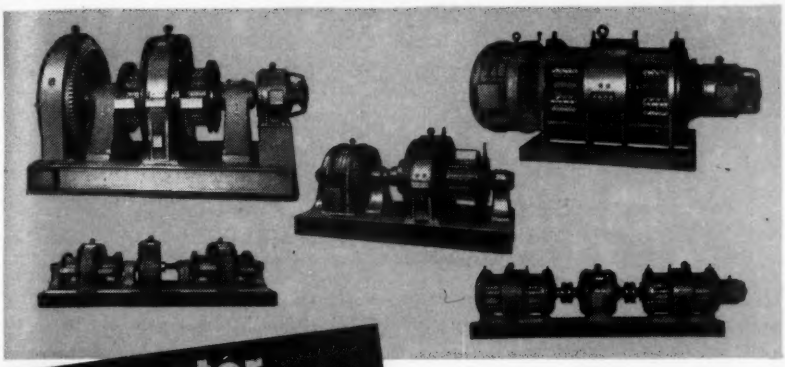

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METALLIC CORROSION, PASSIVITY AND PROTECTION by Ulick R. Evans, Second Edition, 1946, XXI + 863 pages. Edward Arnold and Company, London. Distributed in U. S. by Longmans, Green & Company, Inc., 55 Fifth Avenue, New York City 3. Price, $11.00 + postage.

The appearance of the second edition of Dr. Evans' well-known treatise is a welcome event to workers in the field of corrosion since this book is by all odds the outstanding reference work on the theoretical aspects of the subject. The revision has been quite thorough from the standpoint of bringing the book up to date. Although some material has been dropped, enough new matter has been added to increase the length of the text by enough words to make a small book.

As in the first edition, the author has divided each chapter into three sections which he labels: "The Scientific Basis", "Practical Problems" and "Quantitative Treatment". The value of this procedure may be questioned. It appears to lead to a considerable amount of repetition within a single chapter, and there are times, at least, when it is difficult to find information relating to some specific point. Furthermore, it is often necessary to look in three separate places for complete information on a selected subject. This reviewer cannot help but feel that the method of presentation used here is cumbersome.

It is stated in the preface that references are reasonably complete to the end of 1944 and several important papers published in 1945 have received notice. It is hardly necessary to point out that one of the great values of Dr. Evans' book stems from the extremely complete annotations to pertinent literature.

It was a little surprising to find that the new edition does not give any attention to the very important problem of the corrosion of bearings, particularly those used in internal combustion engines. It is true that research in this field has been limited to the last few years, but several important publications appeared prior to 1944 and it is felt that discussion of them should have been included. Also comparatively little notice is taken of corrosion caused either directly or indirectly by bacteria, and the section on corrosion due to anti fouling paints is weak.

As in the earlier edition, the discussion of the application of metallic coatings is of a general rather than specific nature, but it constitutes a splendid resume of the principles of electroplating, and, in conjunction with a large number of references, comprises an excellent guide for study in the theory of electroplating.

The book, as a whole, represents a tremendous amount of work, the result of which should be available to every metal finisher who is in any way concerned with research or development. It should be pointed out, however, that the practical electroplater whose interest lies primarily in plant operation, trouble shooting and the meeting of specifications will find little in this book of direct assistance in the solution of his everyday problems. This is true both with respect to metal finishing and corrosion, since the author's attention focuses mainly on theory.

The volume is indexed separately as to authors and subjects. Unfortunately, the latter is only fairly satisfactory, and it is often difficult to locate information unless one is reasonably familiar with the book.

Tanks Tailored to Your Needs

WHEN making plant or process changes, remember that you can often realize big operating savings by a complete redesign of tank equipment, planned and built with the right capacity for continuous performance. At the same time you should provide for the most suitable fittings and accessories. Of course each tank must be made of the correct material or with the correct lining for best corrosion resistance. Storts experience in the fabrication of single tanks and complete cycles for many hundreds of severe service requirements will help you to design for best economy.

STORTS WELDING COMPANY

42 Stone Street Meriden, Conn.

Manufacturers of Welded Fabrications to Specification

Coming Events

EIGHTH ANNUAL NEW ENGLAND REGIONAL MEETING

New Haven—April 26

TECHNICAL EDUCATION PROGRAM

2:00 to 5:00 P. M., Hotel Taft Ballroom

Educational Chairman, I. LAIRD NEWELL
Technical Consultant at
Henry Souther Engineering Corporation
Hartford, Conn.

Speaker	*Subject*
DR. D. T. EWING Professor of Physical Chemistry Michigan State College	*"Removal of Metallic Impurities in Nickel Solutions"*
MR. PAUL SWARTZ Chief Metallurgist L. C. Smith and Corona Typewriters, Inc.	*"The Effects of Heat Treatment on Tumble Deburring"*
MR. GEORGE JERNSTEDT Mgr. Electroplating Project Westinghouse Electric Corporation	*"Periodic Reverse Plating"*

LADIES' PROGRAM

2:30 P. M., Matinee Shubert Theatre

BANQUET ENTERTAINMENT DANCING
7:00 P. M. Hotel Taft Ballroom

Tickets, $5.00 each; Tax included

NEW YORK BRANCH

Annual Educational Session and Banquet
Hotel Pennsylvania, New York
April 19

EDUCATIONAL SESSION

2:30 P. M. in Salle Moderne

1. *"Metallizing Plastics"*
   MR. HAROLD NARCUS, Electrochemical Industries, Worcester, Mass.
2. *"Plating on Zinc Die Castings"*
   MR. WALTER PRINE, The International Nickel Company, New York City
3. *"Significance of Polarization in Electroplating"*
   DR. HAROLD BANDES, Sylvania Electric Corporation, New York City

BANQUET

7:30 P. M. in Roof Garden

For reservations write to:
MILTON NADEL
41–15 Fiftieth Avenue
Long Island City 4, N. Y.
Chairman, Banquet Committee

MILWAUKEE BRANCH

The Annual Educational Session and Banquet will be held on Saturday, April 26, in Schroeder Hotel, Milwaukee.

Three important papers will be presented at the Educational Session which starts at 2 P. M. The Branch feels very fortunate in having three of the most eminent men in the Society to present them.

The speakers and their subjects are:

1. FRANK K. SAVAGE, Kuehne Manufacturing Company, A. E. S. President: "*Wage Incentives in the Plating Room*".
2. WALTER L. PINNER, Houdaille-Hershey Corporation, A. E. S. Past President: "*Bright Acid Copper Plating*".
3. MYRON B. DIGGIN, Hanson-Van Winkle-Munning Company: "*P R Plating Process*".

The Educational Session will be followed at 7 P. M. by the Annual Banquet. As our guests well know from the past, Milwaukee Banquets are characterized by good food, pleasing music and excellent entertainment.

L. DIVELEY,
Chairman, Publicity Committee.

SPRINGFIELD BRANCH

The February meeting on the 24th was called to order by PRESIDENT CHESTER KLIMEK who introduced the speaker, MR. GEORGE B. HOGABOOM.

Mr. Hogaboom gave a very interesting talk on "The Cleaning of Steel" based on his wide experience. Following a question period, Mr. Hogaboom outlined briefly the proposed Constitution.

A. E. S. THIRD VICE-PRESIDENT ARTHUR LOGOZZO then told of the plans for the coming Eighth Annual New England Regional Meeting and described the ambitious program for the Industrial Finishing Exposition in Detroit.

LAURENCE R. FOUNTAIN,
Secretary-Treasurer.

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BUFFALO BRANCH

A very large group was fortunate in hearing DR. J. E. STARECK, Director of Research, United Chromium, Inc., give an informative talk on "Electrocolor and Patternplate" at the February meeting.

It was a rare treat to see plate that was perfect in brightness and reflection and also had all the colors of the spectrum in all its glory. We were privileged to see plate purposely provided with "pits" and "cracks" opening our eyes both literally and figuratively with the beauty of the result.

Man and monkey must be very much alike because all reached for the beautiful samples of finished work and did not wish to part with them.

The description of what took place in the bath was most entertaining with battles, divorces and gunning of the ions.

VICE-PRESIDENT C. J. WERNLUND presided in the absence of PRESIDENT SEIBERT JOHNSON, who is enjoying a vacation in the slightly warmer clime of Florida (courtesy Buffalo Chamber of Commerce).

CHARLES LOGAN, Chairman of our Annual Educational Session, reported the plans well advanced for a fine session.

K. K. CARPENTER was appointed Chairman of the Research Committee for the Buffalo Branch.

B. KIRCHOFF, L. NOWAK, and K. MAU were appointed to serve on the Nominating Committee for the coming election of Officers.

W. M. FOTHERINGHAM,
Review Correspondent.

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LANCASTER BRANCH

Seventeen members and guests attended the regular monthly meeting on February 14 at the Stevens Trade School.

Fifty dollars will be taken from the treasury and used for our second Ladies' Night in April.

LIBRARIAN NORMAN GEBERT introduced our speaker, MR. THEODORE R. SCHWALM of Lancaster, Pa. His subject was "What Is Throwing Power?" After briefly discussing the electrical hookup in a plating plant, Mr. Schwalm spoke on some of the problems in

plating such as poor throwing power, streaking and pitting. These difficulties can be traced to two sources, current distribution and lack of chemical balance in the plating bath.

H. Clay Brubaker,
Secretary.

DETROIT BRANCH

The February meeting was held on the 7th in Hotel Statler.

A minute's silence was asked in memory of Kenneth G. Wall who died of polio earlier that evening.

After the brief business session during which time a half dozen new applicants were elected to membership, the meeting was turned over to Librarian George A. Pillsbury. The picture was an enjoyable color-sound film entitled "A Seven Day Adventure Cruise", courtesy Georgian Bay Lines, showing the sights and various avtivities along the Great Lakes.

Mr. Henry Bock was chairman for a series of presentations by members of the local job shop association. Mr. J. J. Malone, Mr. Ed Berry, and Mr. Raymond Shock covered various phases of the job shops' place in industry. A number of interesting and instructive sidelights were brought to the attention of the 150 members and guests present.

R. H. Dudley,
Publicity Chairman.

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BRIDGEPORT BRANCH

There were forty-seven members and guests at the Old Timers' Night in the Casco Products Company Club Rooms on February 7.

Dr. W. R. Meyer introduced Mr. Austin Fletcher of the Syracuse Branch who spoke briefly to his old-time friends.

During the brief business session, two men were elected to membership and two applications were received.

President H. M. Goldman then turned the meeting over to William Ehrencrona, Chairman of the Old Timers' Committee. His program included two good moving pictures, "Inside Football" and "The World Series of 1946", and a Smorgasbord accompanied by excellent refreshments. Needless to mention we had a very good time meeting old friends, exchanging experiences and ideas and playing card games. We thank Bill Ehrencrona for making it possible to have this party at the Casco Products Company; it certainly was an ideal place to hold such an affair.

The Open Meeting scheduled for February 21 was cancelled due to an unexpected snow storm on February 20, 1947.

J. G. Sterling,
Secretary-Treasurer.

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HARTFORD BRANCH

A crowd of thirty-five enjoyed the dinner before the Open Meeting on February 17. William Cullen who served as technical chairman for the evening introduced Mr. William S. Wise of the Connecticut State Water Commission. His talk on "Treatment of Plating Room Wastes" was extended to embrace pollution abatement in general. He explained why control of stream pollution is under sectional jurisdiction and should remain so rather than become controlled nationally.

Sixty-five members and guests were present to hear the speaker. Refreshments were served when the talk was completed and all questions had been answered.

F. W. Smith, *Secretary.*

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SOUTHEASTERN BRANCH

The regular monthly meeting on February 13 was held at the Cox-Carlton Hotel with twenty-two members and guests present.

The following committees were appointed: C. H. Hohner and Carl Cartlege to obtain full information about the cost, etc., for a display at the Southern Machinery and Metals Exposition to be held in Atlanta during April; H. R. Stogner, M. E. Awtrey and B. Deutschman to obtain sustaining members for the Society.

After a good steak supper, our guest speaker of the evening, A. E. S. First Vice-President Kenneth M. Huston was introduced by C. H. Hohner. Mr. Huston spoke about electropolishing and illustrated his talk with slides and samples. We felt highly honored by his presence and enjoyed his

talk very much. We do hope to have him with us again soon.

WILLIAM T. WEYMOUTH,
Secretary.

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PHILADELPHIA BRANCH

PRESIDENT ORLIK opened the February meeting with some forty members present.

Five new applications were referred to the Board of Managers, and eleven applicants were elected to membership.

The new Constitution was turned over to the Board of Managers for study and discussion. A report will be made at the next meeting after it has been considered by the officers.

LIBRARIAN HIRSCH introduced MR. KENNETH TATOR, President of Industrial Lining Engineers, Edgeworth, Pa., whose subject was "The Newer Rubbers and Plastics as Electroplating Maintenance Materials". Mr. Tator discussed the relative merits of rubber and plastics. Both require good bonding to the base metal by prime coating or other means. Samples of the various materials illustrated the able presentation.

PAUL MENTZER, SR., *Secretary.*

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TORONTO BRANCH

The February meeting was held on the 14th with thirty-nine members and guests present.

Tickets for the Lucky Draw were bought by everyone during the dinner. The first prize, a silver cocktail shaker donated by Silverware Products Company, was won by BENNY CAMERON; the second prize, a silver relish dish donated by Lipmans Brothers, by DAVE GORDON.

An entertaining movie period followed the dinner with films showing the manufacture of cigarettes, a fishing trip on the ocean, and winter sports.

There were six applications for membership. JOE FITZSIMMONS reported for the Bowling Committee. JOHN ACHESON advised that the Annual Euchre Party would be held on March 26 in Maloney's Art Galleries. The guest speake , MR. MARTIN MAHER of Oakite Products, Inc., President of the NewYork Branch, spoke about "The Coloring of Aluminum and Its Alloys", with special reference to the Alumilite Process.

The most important property of the oxide coating is its porosity which determines hardness and absorbtiveness as well as corrosion and wear resistance. Color is controlled largely not in the dye bath but in the anodizing bath.

Weak dye baths are used, and dumped when spent or contaminated with copper or aluminum salts. The *p*H is not too important if good dyes are selected. Temperature of the anodizing bath has the greatest effect on porosity and must be closely controlled. An increase in temperature, time, current density, or concentration will increase the porosity of the coating and darken the color. Good rinsing of silicate cleaners is necessary before anodizing since residues affect the dyeing.

After his one hour informative talk, Mr. Maher answered questions for forty minutes.

J. L. VAUGHAN,
Review Correspondent.

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TWIN CITY BRANCH

There were forty-eight persons present at the meeting on March 3.

Following the introduction of guests, MEMBERSHIP CHAIRMAN A. T. LEONARD introduced our new members.

PRESIDENT LILLICROP announced the appointment of two committees—the Party Committee: JOHN LYNARD, Chairman; HAL JOHNSON and RALPH B. MADDOCK, and the Nominating Committee: C. A. BOWMAN, Chairman, JEROME WELLER and H. E. DIMICK.

Following the business meeting, DR. WALTER MEYER of Enthone, Incorporated, spoke on "The Preparation of Metals for Electroplating" and showed interesting slides of his recent trip to Florida and Nassau.

ROBERT L. BUCKLEY,
Secretary-Treasurer.

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SYRACUSE BRANCH

There were two elections to membership, one out-transfer and one suspension at the Febraury 14 meeting.

The proposed new Constitution was discussed and referred to the following committee for a report at the next meeting:

GEORGE SIMMONS, Chairman, PAUL SWARTZ and ROBERT NORTON,

LIBRARIAN PAUL SWARTZ introduced MR. MYRON DIGGIN of Hanson-Van Winkle-Munning Company who spoke about "Periodic Reverse Current Plating". He discussed the theory and applications of this new method of plating which arose from research work of the Westinghouse Corporation. The process, at present, is applicable to cyanide solutions, eliminates pores, gives a smoother deposit, allows a higher plating rate, improves the brightness, and provides better metal distribution. Several questions and answers on details of the process and on its application to specific plating problems closed the meeting, which had an attendance of thirty-four.

N. F. MURPHY, *Secretary.*

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SYDNEY BRANCH

The newly elected President opened the regular meeting on February 11, at the Railway & Tramway Institute, Sydney, Australia. Following the business session, he gave a Presidential Address which was followed by a short talk on the use of bipolar anodes.

The small attendance of twenty members was due mainly to the difficulty of securing suitable accommodation to hold our meetings.

It was decided to ballot for new applicants in the last quarter of each year only and to initiate them at the first meeting of the following quarter.

In view of the fact that nineteen members were suspended for non-payment of dues and six members were lost through other causes, the President appointed J. SCHIFF Chairman of a Membership Committee to start a drive for new members.

The members present decided to ask the Los Angeles Branch to act as proxy for us at the next Convention.

J. R. GODFREY,
Secretary-Treasurer.

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NEWARK BRANCH

MR. KENNETH TATOR, Industrial Lining Engineers, Inc., of Edgeworth, Pa., was the featured speaker at the meeting on February 7. His subject was "The Newer Rubbers and Plastics as Electroplating Maintenance Materials". Mr. Tator spoke about tank linings and racks; the different kinds of synthetic rubbers that could be made and used, their applications and the shortcomings of each. Either sheet or liquid can be used; the sheet has the advantage of equal thickness but the seams are a disadvantage.

Three applicants were elected to membership and three new applications were received.

The Branch voted to contribute $25.00 to the Red Cross.

GEORGE REUTERS,
Assistant Secretary.

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LOS ANGELES BRANCH

Los Angeles Branch held its regular meetong on February 10. Fifty-one dinners were served and approximately sixty attended the meeting.

MR. RICHARD J. WOOLEY of United Chromium, Inc., read a paper entitled "Rack Coatings". (See L. A. Critchfield, THE MONTHLY REVIEW **33**, 152 [1946].) A rapid exchange of questions and answers followed:

Q. 1. (Richardson): What can be done to avoid dripping marks on the points?—A. (Wooley): The viscosity is too high.

Q. 2. Do you recommend brushing?—A. (Wooley): Only of final coats. Brushing tends to produce thin spots.

Q. 3: How do rack coatings stand up in trichlorethylene degreasers?—A. (Wooley): No rack coatings on the market are known to stand up. Resistant coatings are in the experimental stage of development.

Q. 4: Do the rack coatings deteriorate in emulsion solvent degreasers?—A. (Wooley): These coatings are known to stand up in many of the solvent emulsions, but further experiments would be necessary before a generalization can be made.

Q. 5: Have you tried taping followed by dip coating?—A. (Wooley): Asbestos or cloth tapes can be used.

Q. 6. (Stew Potter): We occasionally obtain a rainbow colored effect on chromium plating and normally such work is rejected. Now when the customer wants the rainbow color on all articles, I find that it is very

difficult to duplicate. How can we favor the deposition of rainbow colored chromium?—A. (Wooley): This effect is reproducible only under certain narrow limits of chromic acid to sulfate ratio and ranges of current density. The "Electrocolor" process deposits a cuprous oxide coating which requires to be lacquered. There are several resistant clear lacquers which satisfy the requirements of the state food laws.—A. (Lostutter): From my experience this appears to be a problem of oxidization of the nickel before chromium plating or poor connections in the chromium bath.—A. (Merigold): I believe that you can obtain this effect by boiling the article in sodium hyposulfite and then dipping into lead acetate, approximately one ounce per gallon.

M. RASKIN announced two courses in "Science and Practice of Electro-plating, Parts I and II" offered by the University of California at Los Angeles, Instructor M. Raskin.

One member was suspended.

E. R. HOLMAN,
Secretary-Treasurer.

TOLEDO BRANCH

In the absence of PRESIDENT MINER, the regular meeting on December 5 was called to order by C. T. VANNARSDALL with 20 members present.

The Branch voted to instruct its Convention Delegates to vote affirmatively on a motion to suspend the Constitution while the revised Constitution is being presented and acted upon.

GLENN NOE conducted a 30-minute question box. Several important questions were answered by the members.

G. BERGEMAN,
Secretary-Treasurer.

ROCHESTER BRANCH

There was one application for membership at the February 28 meeting. Three members requested transfer to other Branches.

LIBRARIAN JOSEPH HULL introduced MR. WILLIAM JACKSON of The Udylite Corporation, who gave an illustrated lecture on "Plating Barrels and Auxiliary Equipment". A lively discussion period followed. Much credit is due DONALD BLUM, local representative of The Udylite Corporation, for his active cooperation in obtaining the large turnout.

ROBERT L. FLINT, *Secretary.*

BALTIMORE-WASHINGTON BRANCH

Fifty-eight members weathered the snow and zero temperature to attend the Annual Educational Session on February 4 at the National Bureau of Standards.

DR. WALTER R. MEYER of Enthone, Incorporated spoke on "The Preparation of Metals for Electroplating". He gave the general composition and properties of good cleaning agents and detailed methods for the precleaning of specific metals. Interesting slides illustrated the lecture.

MR. F. L. LAQUE of the International Nickel Company spoke on "Galvanic Corrosion as Related to Electroplated Deposits". He emphasized that corrosion is an electrochemical problem and suggested means for avoiding the galvanic corrosion of specific metal surfaces. Problems of corrosion involving metal couples were illustrated with slides. Valuable discussions followed each talk.

After the meeting had been adjourned, the Branch provided an informal social and buffet snack. Through the efforts of the hostess, MRS. WENDELL BARROWS, the food was plentiful and delicious. In contrast to previous years when expensive banquets were held, the Branch defrayed all the expenses for both meeting and social.

GRACE RIDDELL, *Secretary.*

"Deposition of Chromium" Author Correction

Through an error in the Production Department, Mr. Grube's name was given as Guthrie in the article which appeared in the February issue.

Mr. J. M. Guthrie is the co-author of an article on "Plating on Aluminum" which appears in this issue.

Our apologies!

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By KENNETH M. HUSTON
Chairman, Program and Educational Committee

Dyeing of Anodized Aluminum

J. P. GILL. *J. Electrodepositors' Tech. Soc.* **21**, 235–244 (1946).

Not many dyes are found suitable for the dyeing of anodized aluminum, probably because lack of ability to "lake" or coordinate with the alumina of the film. Tests were made on the fastness of different dyes to light, heat, cold water, boiling water, and washing. The recently developed process of cold dyeing (at room temperature) and steam fixation (exposure in a steam chamber for 15 minutes) was shown definitely superior to the hot dyeing and wet sealing process. Films produced by the sulfuric acid process were found superior to those produced by the chromic acid process.

The effects of different alloying elements on the film and its dyeing properties were investigated. In general, the purer the aluminum, the better the film. Various processes for producing multicolored effects were discussed.

LYMAN B. SPERRY.

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Health Hazards in the Electroplating Industry

L. B. BOURNE. *J. Electrodepositors' Tech. Soc.* **21**, 121–128 (1946).

The history of occupational health is reviewed, starting as far back as 300 B. C. As to the special problems of platers, it is concluded that risks of the trade may be greatly reduced by adequate ventilation, automatic machinery, cleanliness, protective clothing, barrier creams, etc.

LYMAN B. SPERRY.

Defects in Plating Solutions and Their Remedies

P. BERGER. *J. Electrodepositors' Tech. Soc.* **21**, 195–209 (1946).

This paper is for the use of the practical plater in preventing and curing common difficulties in the job shop with solutions of copper, nickel, chromium, zinc, cadmium, tin, lead, silver, and brass.

LYMAN B. SPERRY.

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Electroplating on Aluminum

E. G. WEST. *J. Electrodepositors' Tech. Soc.* **21**, 211–226 (1946).

The theories of adhesion of electroplate to aluminum are reviewed. Commercial methods may be divided into three distinct series of operations, viz.: (a) cleaning, (b) preparation of the surface, and (c) deposition. Each is discussed in detail. Various proprietary processes, and the principle on which they operate, are discussed, among them (1) surface roughening by etching (Work, Alcoa); (2) etching combined with an immersion deposit (Work, Alcoa, "Sailerite", "F. B. M.", and "D. V. L." processes); (3) the zinc immersion process (several processes, including the Enthone process which incorporates univalent copper salts to slow down and better control the zinc deposition); (4) oxide deposition prior to plating, which film may or may not be modified before plating (Alrok, Krome-Alume). Polishing and racking of the parts and testing of the plated articles are also discussed.

LYMAN B. SPERRY.

Surface Condition and Reflectivity of Metals

J. H. NELSON. *J. Electrodepositors' Tech. Soc.* **21**, 113–120 (1946).

This paper discusses "the reflection of light by metal surfaces from the point of view of an observer looking at a metal article" and optical theory as applied to metal surfaces. Surface blemishes may be divided into two types. The first is contour irregularities, illustrated by slight waviness in an approximately plain surface which is, generally unimportant in a plated article because of the curvature of the surface of the product. It always occurs in buffing operations. The second consists of small fissures in the surface which remain even after the finest lapping operation and may be nearly millionth of an inch. To remove both types of blemish, superfinishing, as applied by Chrysler Corporation, is used. The two most valuable methods of surface examination are (a) direct comparison, especially by low-power microscope, and (b) by profilometer. Charts and illustrations are presented.

LYMAN B. SPERRY.

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Polishing Methods and Technique

L. MABLE. *J. Electrodepositors' Tech. Soc.* **21**, 103–112 (1946).

Polishing shops should be laid out so that buffing machines are placed away from polishing machines and provided with ductwork which is efficiently designed and easily cleaned out.

Emery abrasive holds well to the polishing wheels due to the shape of the grains and may be used sooner after being set up than any other abrasive. Manufactured abrasives are faster cutting and longer lasting. To maintain these advantages (a) glue must be of best quality, (b) 24 hours drying time must be employed with one coat and 48 with two coats of abrasive, (c) with soft metals, the abrasive should be one or two grades finer than the emery, (d) operators must learn new "touch".

"Trent Sand" is the best medium for polishing intricate jewelry. A felt bob is used and the sand is fed in between the wheel and the work.

Twenty-five hundred r.p.m. will meet most requirements for polishing. Too high a speed will cause wheel to cut less.

L. M. MORSE.

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Plating Die Castings

E. A. OLLARD and E. B. SMITH. *Metal Industry* (London) **68**, 246–248, 325–328, 366–368 (1946).

This series of articles describes the complete process of polishing and copper-nickel-chromium plating as practised in England.

Conditions of casting should favor the formation of a hard, dense and thick skin around the more porous center. With a minimum of surface imperfection, polishing can be kept to a minimum and the dense skin preserved. Most castings require some polishing: removal of flashes with abrasive wheels, cutting down the surface with 120 dry and then 120 grease wheels, and tripoli finishing. Smaller articles may be rolled first by themselves and then with powder and oil to smooth the surface. Leather and lime is used for final finishing.

Polishing grease is removed by degreasing in trichlorethylene vapors free from hydrochloric acid. This is followed, after rinsing, by mild alkaline cleaning at 180 to 200° F for 1½ to 2 minutes without current in a solution of 4 to 6 ounces per gallon of a mixture of ⅓ tri-sodium phosphate and ⅔ sodium metasilicate, sometimes with a wetting agent. Following rinsing, the parts are dipped for 5 seconds in 4 to 6 ounces per gallon of sodium cyanide solution, usually followed by another rinse and a 5-second dip in 5 per cent hydrochloric acid or sulfuric acid solution. The use of soft water throughout the cleaning operations is advocated

The castings are usually copper plated in in a typical Rochelle salt copper bath, 4 ounces per gallon copper and ½ to 1 ounce

per gallon free cyanide at a *p*H of 12.6, for 10 to 15 minutes at 20 to 50 asf. Die castings must be completely covered with copper to avoid subsequent contamination of the nickel bath with zinc. Small amounts of zinc are not detrimental in the copper bath, larger amounts give brassy deposits.

Following a rinse with or without a subsequent dip in 2 per cent sulfuric acid solution, the nickel is applied in a plain high *p*H Watts bath or in a bright cobalt-nickel bath of the Weisberg-Stoddard or the Hinrichson type.

The aromatic type of bright nickel solution is said not to be widely used because of difficulties with frothing and bath control. Automatic *p*H control is feasible for large solutions.

The baths often tolerate 1 g/l iron. Organic contamination may be detected by means of titration with potassium permanganate. They may be removed with activated carbon or clay, by bubbling sulfur dioxide through the bath or by treatment with potassium permanganate, the excess of which is removed with the correct amount of hydrogen peroxide. Zinc is removed by liming at 140° followed by peroxide addition and prolonged stirring and finally filteing through activated carbon. Another method is low current density plating. A third method is treatment with ferrous sulfate, raising the *p*H to 5.0–5.5. and addition of peroxide at 160° F. Zinc may be kept out of the bath by plugging the holes in the castings.

Lead or monel metal should not be used in contact with bright nickel; pure nickel or stainless steel is recommended.

The final operation is chromium plating for 5 to 7 minutes in a solution containing 68 ounces per gallon chromic acid with a 100/1 sulfate ratio at 90–100 asf and 10) to 110° F.

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Cleaning and Finishing Aluminum Products

MOT WINSHURST. *Ind. Finishing* **23**, 32–38 (November 1946).

Directions are given for surface cleaning and preparation prior to the application of organic finishes on four classes of aluminum products: flat sheets, shaped metal parts, deep drawn parts, and tubular frames.

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Measurement of Embrittlement During Chromium and Cadmium Electroplating and the Nature of Recovery of Plated Articles

CARL A. ZAPFFE and M. ELEANOR HASLEM. *A. S. M. Preprint*, No. 29 (1946), 20 pp.

Fourth in a series of papers exploring the nature of hydrogen embrittlement as measured by the constant-rate single-bend test, the present paper studies the embrittlement resulting from electroplating, specifically chromium plating and cadmium plating of 17 per cent chromium–1 per cent carbon stainless steel wire in the annealed and in the cold-drawn conditions. Curves are obtained which show the course of embrittlement with increasing plating time and the remarkable comparison of chromium plating and cadmium plating with one another and with straight hydrogen plating as hydrogenizers of steel. The study of recovery from embrittlement revealed a phenomenon which corroborates an earlier hypothesis by Zapffe and Faust of a double aging effect in plated metal. Some tests preliminary to a subsequent research are also presented which show marked differences in the rates of recovery when plated specimens are aged in different media, such as water, oil, caustic solution, and dry argon, at the same temperature. For articles heavily plated with chromium, temperature is investigated as a variable in the recovery of ductility.

•

Surface Roughness

ANON. *Iron Age* **158**, 81 (December 19, 1946).

David Brown and Sons Ltd., Huddersfield, England, has developed the Topograph for measuring minute roughness of

surface finishes. It operates on a pneumatic principle and gives a pen-record of the profile of the surface along a selected straight track. The instrument can be used for flat and curved surfaces that contain a straight line along which the tracer point may traverse.

•

Phosphate Coating of Aluminum

R. C. GIBSON and W. S. RUSSELL. *Ind. Eng. Chem.* **38**, 1222–1227 (1946).

A process is described which produces on aluminum and its alloys, in form of either sheets or castings, a paint-holding phosphate coating similar to that given iron, steel, zinc, and cadmium surfaces by Bonderite processes. In addition, the solution which contains zinc phosphate, nitrate, and fluoborate also coats zinc and steel and their alloys, an advantage to manufacturers who may have mixed production of these metals. This process requires no electric current, may be applied by spray or immersion in mild steel equipment, and is readily adapted to conveyer production methods. Outdoor exposure tests, as well as accelerated salt spray, humidity, and soak tests, show the improved results obtained by converting the surface of aluminum alloys to a stable, non-metallic, finely crystalline phosphate coating in inhibiting corrosion and increasing the adhesion and resultant durability of applied organic finishes. The phosphate coating permits the use of a variety of paints which cannot be employed effectively over untreated aluminum alloys.

•

Electroplating and the Motor Industry

H. SILMAN. *J. Electrodepositors' Tech. Soc.* **21**, 65–78 (1946).

The emphasis during the war on the functional aspects of plating is expected to improve the durability of post-war vehicles.

The need for collaboration between designers and production finishing personnel at the design stage is pointed out. Avoidance of sharp corners, edges and deep recesses will save metal, polishing labor and prevent contamination of nickel baths in the case of die castings.

Problems in plating radiator shells, grilles, bumpers, hub caps and lamps are discussed. Nickel thicknesses are slightly higher than those used in the U. S. Reflectors may be plated with silver, speculum or rhodium. Springs, especially thin ones, when plated with zinc or cadmium always show a small per cent of breakage due to embrittlement. There is a need for a better protective finish for springs. Future uses of anodizing are discussed.

L. M. MORSE.

•

Continuous Tin Plating of Strip

J. Electrodepositors' Tech. Soc. **21**, 129–148 (1946).

C. FRENKEL, "Continuous Electrotinning of Steel Strip in the Manufacture of Tin Plate": A description of a plant being constructed in England for the electrotinning of steel strip, patterned somewhat after eleven such plants in U. S. Cold rolled steel, 30–32 gauge and 30–36 inches wide, is rolled in lengths of from one to two miles, a roll weighing 4½ to 10 tons, and this material is fed into the set-up at speeds up to 1,000 feet per minute. A diagram of the "Ferrostan" electrolytic tinning line shows each step in the process. The steel is plated at about 200 asf in an acid bath, scrubbed and dried. The tin plate is melted and flowed by either conduction or induction heating. It is then oiled, cut into sheets by a flying shear and piled. P. F. GROVE, "Electrical Equipment for Continuous Strip Electrotinning Lines": Comparison is made between motor-generators, copper oxide and selenium type rectifiers for furnishing the heavy currents required. Photo-electric cells are used to maintain proper feed of material, reject sheets having pin-holes, and control the reflowing process to give a good sheen. Other automatic devices regulate the plating current and vary the line speed.

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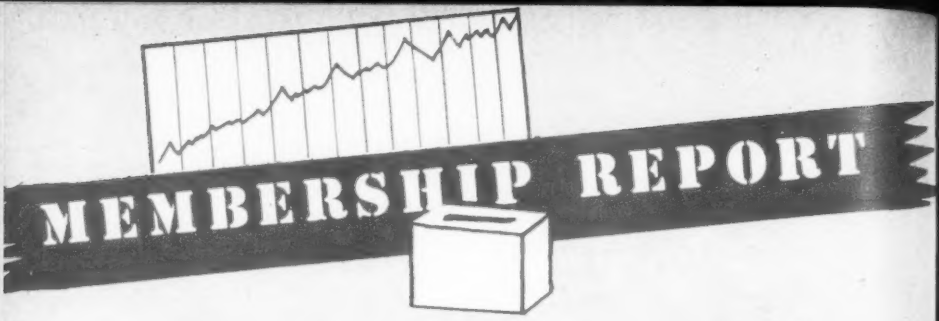

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ASSOCIATE EDITORS' MEETING

The Associate Editors had a dinner meeting at the Benjamin Franklin Hotel, Philaphia, Pa., February 27, 1947.

All members of the Associate Editors' group were present with the exception of Mr. E. R. Holman who regretted in a letter the impossibility of traveling from California for this meeting. Dr. H. J. Read, our Book Reviewer; A. M. Putnam, Advertising Manager, K. G. Soderberg, Editor; and the Executive Secretary were also in attendance.

The editorial policy of THE MONTHLY REVIEW was reviewed, and proposed changes in THE MONTHLY REVIEW were discussed and approved

MEMBERSHIP CHART

BRANCH	Membership May 1, 1946	New Members	Net Change in Membership	Per Cent Net Change
FIRST GROUP				
PHILADELPHIA	170	50	+41½	+24.4
NEW YORK	201	51	+45½	+22.6
BRIDGEPORT	124	28	+24	+19.3
CHICAGO	359	53	+36	+10.0
CLEVELAND	177	34	+12½	+ 7.1
TORONTO	131	12	+ 6	+ 4.6
LOS ANGELES	181	30	+ 7	+ 3.9
BOSTON	168	16	+ 5½	+ 3.3
WATERBURY	128	10	+ 4	+ 3.1
NEWARK	243	20	+ 2½	+ 1.0
HARTFORD	134	17	+ 1	+ 0.7
DETROIT	440	45	−19	− 4.3
SECOND GROUP				
PITTSBURGH	97	26	+25½	+26.3
GRAND RAPIDS	116	20	+18½	+15.9
INDIANAPOLIS	90	10	+13	+14.4
BUFFALO	87	10	+ 9½	+10.9
BALTIMORE-WASH.	114	10	+ 6½	+ 5.7
MILWAUKEE	120	15	+ 4½	+ 3.7
PROV.-ATTLEBORO	122	16	+ 4	+ 3.3
DAYTON	87	11	+ 2	+ 2.3
ROCHESTER	97	4	+ ½	+ 0.5
NEW HAVEN	110	2	− 3½	− 3.2
SPRINGFIELD	82	6	−10	−12.2
ST. LOUIS	122	18	−26	−21.3
SYDNEY	82	11	−18	−21.9
JACKSON-LANSING	85	4	−34½	−40.6
THIRD GROUP				
ST. JOSEPH VALLEY	60	19	+22½	+37.6
ADELAIDE	37	12	+12	+32.5
TWIN CITY	72	27	+22½	+31.2
ROCKFORD	53	9	+ 9	+17.0
SYRACUSE	64	14	+ 8½	+13.3
SAN FRANCISCO	64	11	+ 2½	+ 3.9
MELBOURNE	69	..	+ 1	+ 1.7
COLUMBUS	34	5	+ ½	+ 1.5
LANCASTER	38	1	.....	.....
MONTREAL	61	8	− ½	− 0.8
CINCINNATI	58	1	− 2½	− 4.3
TOLEDO	60	2	− 4	− 6.7
TOTAL A. E. S.	4,527	678	+ 271	+ 6.0

Membership, March 10, 1947.....4,798

"This Report," the Methods Engineer went on, "sets the facts down in black and white. With Cadmium so hard to get—"

"It says here," the Boss interrupted, "that Luster-on* on zinc gives a bright, attractive surface that resists stains, fingermarks and white corrosion."

"That's right," said the M. E. "But from my standpoint the biggest appeal is the cost angle. Luster-on* on zinc costs only about half as much as Cadmium."

"It means revising all your recommendations," the Boss reminded him.

"Exactly. But if plating zinc with Luster-on* makes our product as good — or better—than it's ever been, I'd say that's a better bet than fighting for Cadmium and paying more for it when we do get it."

"That's good sense," the Boss said. "Get all the dope on Luster-on* as soon as you can."

The Boss and his M. E. are talking about a Comprehensive Cost Analysis Report just prepared. In comparing the costs of Luster-on* on zinc with Cadmium, this data reveals some startling facts. A copy will be sent you free by simply filling out and mailing the coupon.

*Patent applied for.

THE *Chemical* CORPORATION

54 Waltham Ave., Springfield 9, Mass.

THE CHEMICAL CORPORATION
54 Waltham Ave.,
Springfield 9, Mass.

Please send us the Comprehensive Cost Analysis that compares the cost of Luster-on* on zinc with Cadmium.

Name_____

Firm Name_____

Address_____

PATENTS

By GEORGE B. HOGABOOM
Consultant, New Britian, Conn.

No. 2,415,169, February 4, 1947—Electrodeposition of Lead—Allen Gray, assignor to E. I. du Pont de Nemours & Company.

According to this invention any anthraquinone sulfonate may be employed in an electrodeposition composition. The bath-soluble salts of the sulfonic acids such as the sodium, potassium, or ammonium salts or partial salts, may suitably be used, and because of their excellent solubility, ease of preparation, and ease of handling in dry form, the sodium salts of sulfonic acids may be preferred.

The amount of an anthraquinone sulfonate to be included in an electroplating composition or bath will vary depending upon the plating system involved, the metal being plated, the magnitude of the effect desired, and other similar factors. They may be used in electroplating baths in combination with other addition agents. When a second addition agent is used, the amount of the second addition may be considerably varied.

EXAMPLE I

Hydrofluoric acid (50% solution)	160.0 g/l
Boric acid	74.4 g/l
Basic lead carbonate	129.0 g/l
Glue	0.1 g/l

To this aqueous solution there was added 0.2 g/l of 1-anthraquinone sodium sulfonate to obtain a bath of this invention.

EXAMPLE II

Litharge	150 g/l
Sulfamic acid	150 g/l
Ammonium sulfamate	75 g/l
1-Anthraquinone sodium sulfonate	0.5 g/l
Sulfite cellulose waste	5 g/l
pH—1.5	

Lead sulfamate plating baths in which anthraquinone sulfonates are particularly effective are definitely acidic. The *p*H should ordinarily be from 0.1 to about 4.2 and preferably 1.0 to 3.0.

CLAIM 1. In a process for the electrodeposition of lead, the step comprising effecting electrodeposition of lead from an acidic, aqueous lead electrodepositing solution in the presence of about .05 to 5.0 grams per litre of an anthraquinone sulfonate and 1.0 to 5.0 grams per litre of sulfite cellulose waste.

No. 2,415,724, February 11, 1947—Chromium Plating—Frank N. Beall.

The obje t of the invention is to provide a process of chromium plating which is an improvement on present practices particularly in being less sensitive to variations in factors involved in chromium plating and in the quality of the chromium produced.

A preferred solution

Chromic acid	100 pounds
Sodium carbonate	36.5 pounds
Alumina hydrate (commercial)	19 ounces
Water	8 pounds

An etch solution involving an increased amount of acid radical and a bichromate, such as ammonium or sodium bichromate, results in a wider plating range for the truly bright plate.

Sodium bichromate	20 ounces/gallon
Chromic acid	2 ounces/gallon
Sodium chloride	0.04 ounces/gallon
Sulfuric acid	0.10 ounces/gallon

CLAIM 3. The process of plating chromium upon a surface composed largely or entirely of nickel which includes: subjecting

the surface to the non-electrolytic action of a solution containing chromic acid as an oxidizing agent and the acid radical of a strong acid such as hydrochloric acid, sulphuric and hydrofluoric acid to prepare the said metal surface for plating chromium thereon; washing said prepared surface; thereafter immersing said surface in a plating bath containing an aqueous solution of chromic acid in part free and in part combined as a metal salt of chromic acid, the metal of which does not deposit or the salt precipitate to form a colloidal solution, the total chromic acid being at least about 30 ounces per gallon of solution and the free acid constituting approximately 20 to 40% of the total, and a catalyst consisting of at least one of the following class of catalysts, sulphates, fluorides, and fluosilicates in the amount of not over approximately 0.65% of the total chromic acid; and supplying plating current to said surface.

No. 2,416,294, February 25, 1947—Method of Polishing Metal Surfaces—Samuel E. Eaton, assignor to A. D. Little, Inc.

This invention relates to the discovery of an improved method of polishing certain metals by the action of electrolysis.

It is now discovered that if an object (presenting certain metallic surfaces, namely of silver, copper or cadmium, or alloys consisting of two or more of these metals, or alloys consisting primarily of one or more of these metals though with some zinc or nickel present therein in their composition) is subjected, in an electrolytic cell containing a soluble simple cyanide and in which such surface constitutes the anode (which is at a free space from the cathode and from other solid surfaces sufficiently to prevent the effects thereof which are found to promote periodicity or flashing) to a voltage above the polarization potential but below that at which the relatively water insoluble films would tend to form and reform periodically as above described, or permanently accumulate, and diffusion is, per se, sufficient or further promoted by agitation of electrolyte, and such conditions are maintained for some time, that is, until an appreciable amount or proportion of the metal is removed and dissolved in the electrolyte, the metal surface thus treated will be prevented from undergoing the formation of insoluble films and be caused to acquire a high lustrous polish.

An example of optimum silver bath is as follows:

Silver potassium cyanide	0.1 Mol per litre
Free potassium cyanide	0.3 Mol per litre
Sodium sulfate	0.2 Mol per litre
Agitation	50 inches per minute
Current density	12 amp/sq.ft.
Pressure	1.8 volts

Cadmium bath:

Potassium cyanide	1 Mol per litre
Agitation	40 feet per minute
Current density	300 amp/sq.ft.
Pressure	5 volts

If to above bath is added:
Cadmium potassium cyanide
0.1 Mol per litre
the bright polish will be had with

Agitation	8 feet per minute
Current density	80 amp/sq.ft.
Pressure	1.5 volts

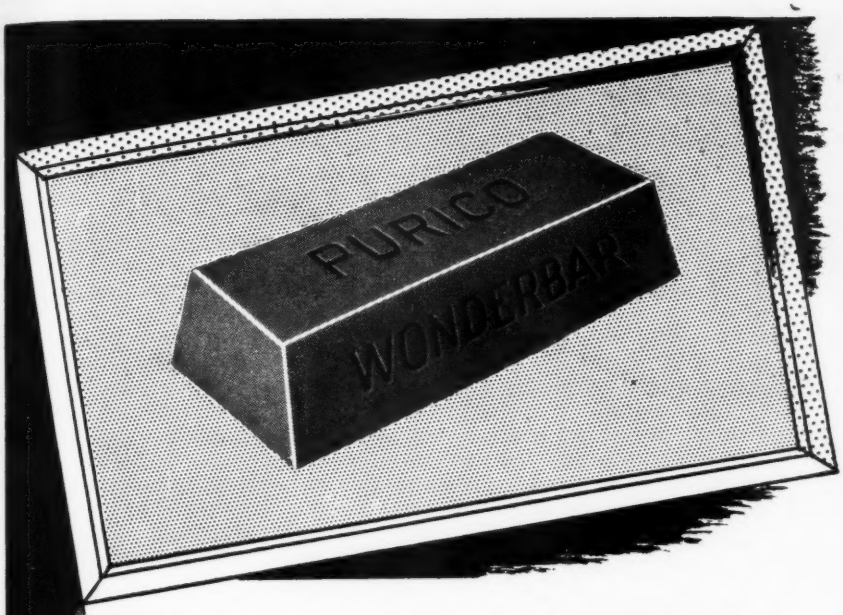
An example of copper polishing:

Potassium cyanide	2 Mols per litre
Agitation	40 feet per minute
Current density	110 amp/sq.ft.
Pressure	3 volts

Brass was polished in:

Potassium cyanide	1 Mol per litre
Agitation	20 feet per minute
Current density	86 amp/sq.ft.
Pressure	8 volts

CLAIM 1. In the anodic polishing of silver, copper, cadmium, alloys consisting of these metals, brass, nickel silver, in cyanide baths, the improvement which comprises employing a substantially constant potential difference between the electrodes which is below the potential at which periodic flashing or permanent film formation occurs, and as an aid in establishing and maintaining the constant potential difference, moving the anode with reference to the electrolyte and solid objects in such a manner that turbulence is avoided and the anode does not approach another solid so closely that flashing is produced, and maintaining these conditions for a period of time to effect the dissolution of superficial protuberances from the surface and leave the surface polished.



HERE'S THE PICTURE

Today, the wheels of industry are geared to peace time production . . . competition is keener. Aware of this, the Metal Finishing Industry demands a buffing compound that assures not only the bright surface required for perfect plating but one that saves time . . . reduces labor costs . . . speeds up production.

Purico WONDERBAR satisfies these requirements! *It's a pre-saponified Tripoli bar composition for efficient and economical buffing of metal parts. It lasts longer on the wheel . . . does not tarnish work . . . speeds up production by eliminating extra manual scrubbing.* Soluble in mild alkali, WONDERBAR rinses quickly from intricate patterns and eliminates expensive degreasing machines.

Start with a Good Finish

★ ★ THE *Puritan* ★ ★

MANUFACTURING COMPANY
29 BENEDICT STREET
WATERBURY, CONNECTICUT

INDUSTRY NEWS

FOREMAN PLATER WANTED

Need competent foreman plater for job shop located in progressive Southern City. Applicant must be qualified to handle silver, copper, nickel and chromium.

Send Replies to MR-4A, The Monthly Review, P.O. Box 168, Jenkintown, Pa.

SALESMEN WANTED

I manufacture the finest Nickel Anode bags obtainable. I have plenty of the highest grade twill in stock. I am a plating chemist, and I know what the trade demands.

If you are interested in a hard-to-get item as a side line, I believe I have an unusual proposition to discuss with you.

Write

WILLIAM PARKER
P. O. Box 209
Worcester 1, Mass.

A. S. T. E. Growing

The *American Society of Tool Engineers*, already one of the largest technical societies in the world, added three new chapters during 1946, according to the report presented by *Henry E. Conrad*, Executive Secretary, at the Society's Annual Convention in Houston, Texas, March 19–22.

These new local groups bring the total number of A. S. T. E. chapters to 75, six of which are located in Canada.

The three new chapters chartered during 1946 are located in Evansville, Ind.; Poughkeepsie, N. Y.; and Madison, Wis.

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News from National Association of Metal Finishers

E. J. Musick, President of the *National Association of Metal Finishers, Inc.*, recently appointed the following committees to handle the affairs of the Association for the present fiscal year:

Finance: *R. A. Campisi*, Boston, Chairman; *Henry Bock*, Detroit; *Walter Plumacher*, New York; *Paul Miller*, Evansville; Membership: *Harold E. Coombes*, Pasadena, Chairman; *Paul Henning*, Detroit; *Joe L. Baar*, Kansas City; *F. A. Hudman*, Houston; Publicity: *Henry Bock*, Detroit, Chairman; *Marus D. Rynkofs*, Los Angeles; *W. O. Zinn*, Chicago; *Paul Henning*, Detroit; Labor: *Philip Sievering, Jr.*, New York, Chairman; *Robert J. Nicholson*, Chicago; *Glenn Friedt*, Detroit; *Harold E. Coombes*, Pasadena.

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The annual meeting of the Association will be held in Detroit, Mich., on June 25, at 6:30 P. M. It will be a dinner meeting, and all owners of metal finishing shops are invited to attend. Further information may be obtained by writing the office of the Association, 2236-39 Dime Building, Detroit 26, Mich.

When Executive Secretary *Raymond M. Shock* attended the recent annual meeting of the *Chicago Electro-Platers Institute*, he was authorized to start preparing a new

manual for job shops, the last one having been published in 1936. The new manual will assist the job shops in figuring jobs by new processes.

The Plating Institute of Michigan has invited the members of the industry to a luncheon on Tuesday, June 24, at 12:30 P. M. The program is now being arranged by *Henry Bock*, Chairman of the meeting.

•

Brown Appoints 38 Men to Engineering Staff

The *Brown Instrument Company*, Philadelphia, has announced the appointment of 38 new sales and service engineers to 23 of its branches throughout the country and Canada.

The assignments, according to *W. H. Steinkamp*, Field Sales Manager for the Brown division of *Minneapolis-Honeywell Regulator Company*, constitute another step to provide better customer service in the application of automatic control equipment. It is also part of a continuing program of sales and production expansion.

All 38 of the newly assigned sales and service engineers have just completed an intensive course in industrial instrumenta tion at the Brown Instrument School from which many industrial engineers have graduated during the past 11 years. The course comprised specialized instruction in addition to the technical education which each engineer had had previously.

The new men and the Brown branches to which each has been assigned are:

Albany: *L. W. Williams*, Sales; Atlanta: *E. P. Medlock* and *S. S. Simpson*, Sales, and *W. S. Harper*, *E. H. Kytle* and *J. D. Tribble*, Service; Baltimore: *B. S. Hazel*, Sales; Boston: *J. D. MacNamara* and *E. H. Benson*, Sales, and *D. E. Martelli*, Service; Charlotte: *J. W. Hughes*, Sales; Chicago: *A. H. Johnson* and *R. R. Scott*, Sales; Cincinnati: *J. P. McCardle*, Sales; Cleveland: *L. N. Brown* and *R. F. Weisehan*, Sales; Detroit: *R. W. Clark*, Sales; Los Angeles: *W. E. Dixon*, Sales, and *W. S. Blackman*, Service; Milwaukee: *J. Aho*, Service; New York City: *M. L. Boyle*, *A. Drexler* and *W. T. Hellegers*, Service; Peoria: *E. H. Fiedler*, Sales; Philadelphia: *S. L. McCarty*, Sales, and *V. H. Turner*, Service; Pittsburgh; *C. W. Briggs*, Sales; Portland,

FOR SALE

THE FOLLOWING EXCELLENT REBUILT AND GUARANTEED ELECTROPLATING MOTOR GENERATOR SETS, WITH FULL CONTROL EQUIPMENT:

1—15,000/7500 AMPERE, 6/12 VOLT, **COLUMBIA ELECTRIC COMPANY**, Latest Design Unit, with Separate M. G. Exciters.
2—5000/2500 AMPERE, 6/12 VOLT, **A. P. MUNNING COMPANY** "OPTIMUS" Design, Separately Excited.
1—5000/2500 AMPERE, 6/12 VOLT, **CHARLES J. BOGUE ELECTRIC COMPANY**, Interpole Design—Separately Excited.
1—4000/2000 AMPERE, 6/12 VOLT, **HANSON & VAN WINKLE COMPANY**, Compound Wound Separately Excited.
1—2500/1250 AMPERE, 6/12 VOLT, **HANSON & VAN WINKLE COMPANY**, Shunt Wound, Separately Excited.
1—2000/1000 AMPERE, 10/20 VOLT, **COLUMBIA ELECTRIC COMPANY**, 25° Unit, with Synchronous Motor Drive.
1—2000/1000 AMPERE, 6/12 VOLT, **HANSON-MUNNING**—40° Unit, with Synchronous Motor Drive.
1—1500/750 AMPERE, 6/12 VOLT, **ELECTRIC PRODUCTS COMPANY**, Separately Excited, Ball-bearing design.
1—1500/750 AMPERE, 6/12 VOLT, **COLUMBIA ELECTRIC COMPANY**, Latest Design, Separately Excited.
1—1500/750 AMPERE, 12/24 VOLT, **CHANDEYSSON ELECTRIC CO.** Unit, Synchronous Motor Drive, Direct Connected Exciter.
3—1000/500 AMPERE, 6/12 VOLT, **CHARLES J. BOGUE ELECTRIC COMPANY**—Practically New—Separately Excited.
1—1000 AMPERE, 25 VOLT, **HANSON-VAN WINKLE-MUNNING COMPANY**—Separately Excited—Anodizing Unit.
1—1000 AMPERE, 15 VOLT, **HANSON-VAN WINKLE-MUNNING COMPANY**—Separately Excited—Anodizing Unit.
10—100 AMPERE, 7½ VOLT, **HOBART ELECTRIC COMPANY**—SPECIAL LOT and SPECIAL PRICE FOR QUICK SALE.

SMALLER UNITS FROM 50 AMPERES UP, CARRIED IN STOCK AT ALL TIMES FOR IMMEDIATE SHIPMENT.

1—**MEAKER** SEMI-AUTOMATIC CONVEYOR UNIT. For Cyanide Plating. Excellent Condition. 20 ft. x 3½ ft. x 4 ft. deep.
ANODIZING MOTOR GENERATOR SETS—in stock for Sulphuric or Chromic Acid Solutions. Large Selection. Write for details.

M. E. BAKER COMPANY 143 SIDNEY STREET CAMBRIDGE, MASS.

Me.: *F. B. Akerson*, Sales; Portland, Ore.: *P. S. Williams*, Sales, and *O. G. Janacek*, Service; San Francisco: *J. R. Culver*, Sales; St. Louis: *S. J. Adams*, Service; Syracuse: *J. A. Bowman*, Sales; Toronto: *R. H. Wright*, Sales, and *J. R. Kent*, Service; Twin City: *A. S. Burnett*, Sales, and *L. McKee*, Service; Washington, D. C.; *E. J. Hart*, Service.

•

Optimus Detergents Company Appoints Clarence M. Smith

Clarence M. Smith, of Lancaster, Pa., has been appointed Field Service Representative for Central Pennsylvania, by *Optimus Detergents Company*, 130 Church Street, Matawan, N. J., manufacturers of industrial cleaning materials.

Mr. Smith has had a wide experience in the industrial cleaning field. A graduate of the Philadelphia College of Pharmacy, he joined the Philadelphia Chemical Supply Company of Harrisburg, as a salesman in 1930. In 1941, he became sales representative in Central Pennsylvania for Magnuson Products Corporation, of Brooklyn.

From 1942 to 1946, Mr. Smith represented Magnus Chemical Company in its Baltimore territory.

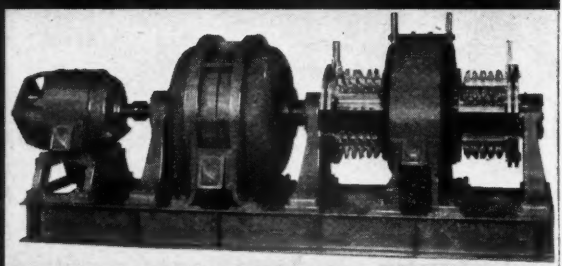
The appointment of Mr. Smith is part of an expanding sales and service program now being undertaken by Optimus.

•

G. J. Doss Heads Electric Products' New Cleveland District Office

To better serve its customers, *The Electric Products Company* announces the establishment of a Cleveland District Office, with headquarters at the factory on 1725 Clarkstone Road, Cleveland 12, Ohio. This district is to be headed by *G. J. Doss*.

COLUMBIA MOTOR GENERATORS



FOR ELECTRO-PLATING

Columbia Generators embody every feature essential for dependable, 24-hour operation. They are built for electroplating service in sizes of 6 to 20 volts, 500 to 20,000 amperes, for anodic treatment of aluminum in sizes of 40, 50, and 60 volts, 500 to 3,000 amperes. Columbia Generators for other electrolytic processes range from ½ to 250 KW, 100 to 40,000 amperes, 6 to 60 volts. Write for full information.

COLUMBIA ELECTRIC MFG. CO.

4519 HAMILTON AVE., N.E. CLEVELAND 14, OHIO

The new District Office will handle all sales and service negotiations in the territory which consists of Western New York and Pennsylvania, Ohio, West Virginia, Kentucky and Tennessee.

Mr. Doss brings to his new position a broad experience in electrical sales and engineering, most of which has been had in this same trading area.

•

Rheem Research Appoints Iridite Distributors

Rheem Research Products, Inc., Baltimore, has announced a new distributor-sales plan for its product, *Iridite*, the corrosion resistant finish for zinc and cadmium surfaces.

Under this plan, Rheem Research has appointed distributors in all of the nation's industrial areas. Each distributor is equipped to handle new sales and render technical service to customers in its territory.

Distributors appointed to date are: Western Michigan: J. C. Miller Company, 55 Mt. Vernon N. W., Grand Rapids 4, Mich.; Eastern Michigan: Wagner Brothers, 400 Midland Avenue, Detroit 3, Mich.; Minnesota and Western Wisconsin: Industrial Chemical and Equipment Company, 316 Builders Exchange, Minneapolis 2, Minn.; St. Louis and Central Southwest: La Salco, Inc., 2820 La Salle Street, St. Louis 4, Mo.; Chicago, Eastern Wisconsin and Iowa: Rheem Research Products, Inc., 20 E. Jackson Boulevard, Chicago, Ill.; Ohio and Indiana: J. C. Baker, 711 Park Building, Cleveland, Ohio; New York and New England: The Mitchell-Bradford Chemical Company, 2446 Main Street, Stratford P. O., Bridgeport, Conn.; Eastern Pennsylvania and New Jersey: MacDermid, Incorporated, Waterbury 88, Conn.

Additional appointments will be announced in the near future.

•

The Udylite Corporation Electric Products Distributor

Gordon J. Berry, Vice-President of *The Electric Products Company*, Cleveland, Ohio, has announced that effective December 1, 1946, *The Udylite Corporation* of Detroit was appointed a distributor of E. P. elec

FOR QUALITY AND UNIFORMITY
SPECIFY **HARRISON 4A PRODUCTS**

STAINLESS STEEL POLISHING COMPOUNDS
Faster Cutting—Increased Production—Economy

DOUBLE HEADER COMPOUNDS
Sizes: 150—180—220—240—320

COMPOUNDS FOR SPRAYING OR DIPPING
Use 4A Cement and Thinner Instead of Glue

Consult Us On Any of Your Problems
We'll Gladly Advise and Send Samples

HARRISON & CO. INC.
Haverhill, Mass.

trolytic motor generators. Udylite, with its nation-wide organization of sales representatives throughout the industrial centers of the country, is in constant contact with all elements of the plating and finishing industry.

•

New Hammond Model "ROL" Polishing and Buffing Lathe

A new addition to the *Hammond of Kalamazoo* line of Polishing and Buffing Lathes is the "*ROL*" model.

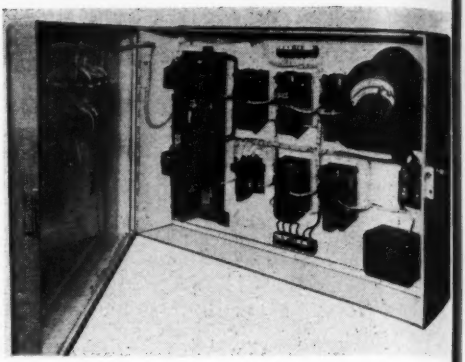
This lathe has an overhanging base to provide liberal working space around the wheel, will accommodate either 2 or 3 h.p. motor and is multi-V-belt driven from motor mounted inside the base. Any single spindle speed can be had.

A request to Hammond Machinery Builders, Inc., 1600 Douglas Avenue, Kalamazoo 54, Mich., will receive prompt attention.

•

Electro-Reversal Control Unit Introduced by Nankervis Company

A mechanism to reverse the polarity and to control a selected time cycle is announced by *The George L. Nankervis Company*, 5442



Second Boulevard, Detroit 2, Mich. The *Nankervis Electro-Reversal Control Unit* consists of a moisture proof cabinet, in which are mounted various instruments such as complete timer controls, relays, discharge resistors, pilot lights, etc., to control the output polarity of electroplating motor generator sets.

While these Electro-Reversal Units have been used for only a relatively short length of time in conjunction with a cyanide copper plating solution, a number of improved results have been noted by users.

IMMEDIATELY AVAILABLE

Rebuilt and Tested

2500 AMPERES, 7 volts

RECTIFIERS

These rectifiers were originally built by Green Electric and have just been rebuilt with all new and larger selenium stacks, conservatively rated at 2500 amps, 7.5 volts. We have added push button control giving precise "On the ampere" adjustment from zero to full load in 45 seconds. Rectifiers have not been used since rebuilding.

Rectifiers can be preset to maximum voltage for striking if desired. Size of unit 38" wide, 26" deep, 83" high.

Input voltage is 480 volts, 60 cycle 3 phase. Test record furnished with each rectifier.

VAN DER HORST CORP. OF AMERICA

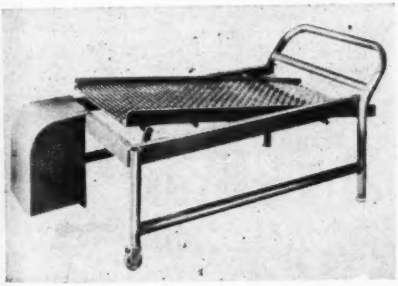
OLEAN, N. Y.

1. Smoother deposits made possible by the reversal phase of the cycle which levels off any nodules formed.
2. Greatly increased allowable cathode current density which will produce greater plate thickness than is obtained in the same period of time with conventional plating methods. This is possible even though part of the process employs a deplating cycle.
3. Improved plate thickness in recess or low current density areas.
4. More pore free deposits.
5. Brighter deposits.

•

Almco, Inc., Introduces Portable Shaker Screen

A portable motor-driven shaker screen for use with deburring and finishing barrels is announced by *Almco, Incorporated,* Albert Lea, Minn. This unit quickly separates the finished work from the tumbling medium, eliminating all hand screening and sorting



The screen is driven by a ½ h.p. or ⅓ h.p. motor, and vibrates in an elliptical path at 380 reciprocations per minute. Length of movement is adjustable from zero to ¾" to meet all requirements. Interchangeable wire screens are available in standard sizes from 3/64" to 2¼" openings, and are removed simply by pushing up and slipping out from between retaining lugs at each end of the frame.

One screening unit will normally serve 3 or 4 barrels; and with casters at one end and a handle at the other, it is readily moved where needed. Its over-all height of 24" (exclusive of the handle) permits this unit to be placed directly under Almco tumbling barrels to separate the load directly on discharge; and there is sufficient

Hammond of KALAMAZOO

BACKSTANDS
CONVERT
GRINDERS-POLISHERS
into high production
ABRASIVE BELT UNITS

Hammond Variable Speed Polishing Lathe and No. 3 Backstand installation.

Hammond Machinery Builders INC.
1613 Douglas Ave. • Kalamazoo 54, Mich.

NEW IMPROVED
LUSTREBRIGHT
BRIGHT NICKEL PROCESS
Produces Lustrous Adherent Nickel Deposits. Ideal Base for Chromium.

No color buffing • No re-cleaning • No re-racking • No special solutions or changes in equipment required • Merely add to cold nickel solution, still or mechanical • No extra equipment • Easy to control • Low in cost • Will not cause plate to peel, become brittle or produce streaky deposits.

Guaranteed not to harm Nickel Solutions

Illustration shows unbuffed deposits before and after Lustrebright.

Write for complete information.

W. C. BRATE COMPANY
Established 1860
18 MARKET ST. ALBANY, N. Y.

clearance beneath the screen for a mobile hoist pan to receive the screened material.

Further information is available on request from Almco, Incorporated, 231 East Clark Street, Albert Lea, Minn.

•

Single Dip Rack Coating Announced

A rack insulator and protective coating that builds up $1/16''$ to $1/4''$ thickness in a single dip has just been announced by *The U. S. Stoneware Company*, Akron, Ohio.

The new coating, known as *Tygoflex Rack Coating*, is based on a new Tygon resin formulation developed to provide thick, impermeable protective membranes for process equipment. When applied by the usual techniques of dipping, spraying, brushing, etc., and subsequently subjected to heat for a very short period, Tygoflex converts to a thick, impermeable insulator, resembling in appearance and physical characteristics a glossy black rubber compound of medium hardness.

Tygoflex Rack Coating will handle all plating acid or alkaline solutions at temperatures up to 250° F for an unlimited time, it is stated. It is unaffected by abrupt temperature changes, handling the full range from boiling cleaners to cold rinse.

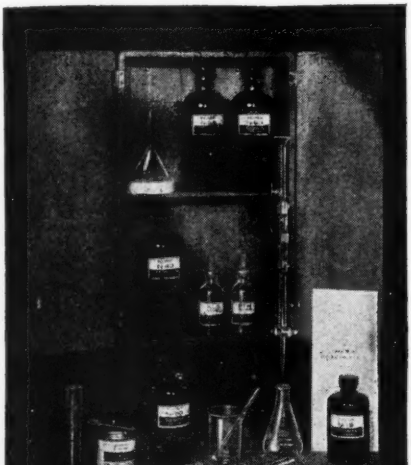
Application procedure is simple. Racks are coated with Tygoflex adhesive, heated, dipped in Tygoflex Rack Coating and fusedby heat (360° F for 10 minutes). Infra red lamps or any heating equipment can be used. There is no fire or explosive hazard as Tygoflex contains no volatiles, solvents, reducers, thinners, etc.

Full details available on request to Process Equipment Division, The U. S Stoneware Company, Akron, Ohio.

•

Optimus Equipment Introduces New Metal Washing Machine

The new No. *WRDXHCF Optimus Flat Conveyor Type Washing Machine* handles the cleaning and processing of metal parts prior to plating. It has just been introduced by *Optimus Equipment Company*, 131 Church Street, Matawan, N. J., engineers and manufacturers of metal cleaning and drying equipment.



CHROMIUM
NICKEL
COPPER

Simple test sets for aid in controlling plating and other solutions.

Write for literature.

KOCOUR CO.

4801 S. ST. LOUIS AVE.
CHICAGO 32, ILL.

Specify Kocour Sets from your supplier.

The new machine handles a sequence of related operations in seven simple consecutive stages: hot alkali wash, drain, hot water rinse, warm cyanide wash, cold rinse to sewer, hot rinse, dry.

The conveyor takes metal parts directly from processes, such as polishing, and feeds directly to the plating machine. The two hot rinses are hooked in sequence, thus affecting a further operating saving. Conveyor can also be built with flight bars for baskets and individual pieces, or with a mesh belt for any type of parts in bulk, or individual pieces.

Over-all size of the machine is 35 feet in length, 6 feet in width, and 7 feet in height. It is designed with a belt speed of four feet per minute for a production in excess of 100 parts per minute and can be adapted to a wide range of speeds and types of treatment.

•

Hammond Announces New Polishing and Buffing Lathe

Hammond Machinery Builders, Inc., 1600 Douglas Avenue, Kalamazoo 54, Mich., has announced a new addition to their line of Polishing and Buffing Lathes. It is known as the *Model "VROL"*—a 3 HP Variable Speed Polishing and Buffing Lathe with a speed range of 1500 to 3000 r.p.m. This is accomplished by turning the hand operated dial. The spindle overhangs 8 inches to permit handling of bulky parts. Motor is mounted in the base with "V" belt drive.

Hammomd of Kalamazoo also announced a new polishing machinery catalog, *No. 55*, which carries specifications covering their complete line of polishing and buffing machinery as well as the new "VROL" Variable Speed Lathe.

•

New Streamlined Machine Blows, Vacuums and Sprays

Holub Industries, Inc., Sycamore, Ill., has announced a *No. 77* model Blower and Cleaner which is a new streamlined machine in a hard, baked enamel finish. It is approved by Underwriters' Laboratories, has a one-horse power, sealed ball-bearing motor and is guaranteed for a year.

For information, write Holub Industries, Inc., Sycamore, Ill.

"YANKEE BRAND"

PROGRESSIVELY BETTER ABRASIVE COMPOUNDS

Tailored to fit all finishing requirements.

Inquiries respectfully solicited

★

E. E. SEELEY COMPANY

(est. 1919)

Manufacturers

BUFFING COMPOSITIONS
FOUNDRY FACINGS

900 Housatonic Ave., Bridgeport, Conn.
Tel. 5-0943

Custom-Built
TANKS
For Cleaning, Pickling and Plating

● For 39 years leading manufacturers have relied on Kirk & Blum for custom-built tanks to meet their individual production requirements.

We are equipped to fabricate tanks of Steel, Lead or Rubber Lined, Monel Metal, Stainless Steel, Copper, Aluminum, Inconel, etc.

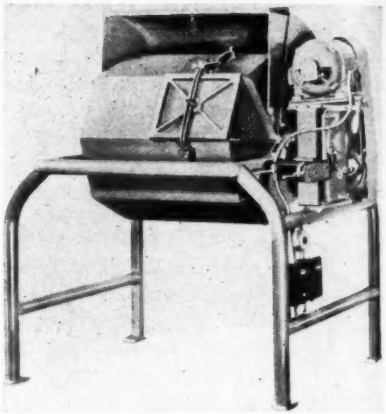
Tanks are supplied with or without exhaust ducts and fans as conditions or specifications indicate.

KIRK AND BLUM

The KIRK & BLUM Mfg. Co.
2887 Spring Grove Ave.
Cincinnati 25, Ohio

Bulletin on Deburring and Finishing Barrels

Almco, Incorporated announces a line of 11 octagonal deburring and finishing barrels of 30-inch diameter and 32 to 60-inch length, with 9 standard compartment sizes from 12 to 60-inch length. Design features include 4-speed drive, quick-clamp doors and welded steel construction throughout.



These barrels are furnished either plain (unlined) or with full neoprene lining. They are motor-driven at 10, 15, 20 or 30 r.p.m. (approx.) through a speed reducer and 4-step V-belt pulleys, a lever-operated belt release mechanism permitting quick selection of the desired speed. To facilitate positioning of the barrel for loading and unloading, rotation in both directions is controlled by a start-stop lever which applies a hydraulic brake when in the "stop" position.

The compartment doors are light in weight (21¼ pounds each for 16-inch compartment) and are opened and closed by a quick-acting toggle clamp. The clamping lever permits the door to be cracked open for draining before unloading. All doors have a water-tight sponge rubber seal, with a take-up adjustment to compensate for eventual compression of the seal. For rapid and complete unloading, door openings come within ¾ inch of the compartment end walls.

All Almco barrels are mounted in a welded tubular steel frame, giving free ac-

LARGE CASTINGS—SMALL METAL PARTS—LONG THIN PIPES ARE THOROUGHLY AND QUICKLY CLEANED IN A

BLAKESLEE

SOLVENT *Vapor* DEGREASER

G. S. BLAKESLEE & CO.

BLACOSOLV DEGREASERS AND SOLVENT

NIAGARA METAL PARTS WASHERS

G. S. BLAKESLEE CO., CHICAGO 50, ILLINOIS · New York, N. Y. · Toronto, Ont.

cess to the doors for loading. To permit unloading directly into a work pan or onto a screen, there is 28-inch clearance beneath the barrel. The barrel itself has an approved guard rail and pull-down safety hood, and the driving mechanism is fully enclosed to meet all safety requirements.

A descriptive bulletin is available on request from Almco, Incorporated, 231 E. Clark Street, Albert Lea, Minnesota.

•

Brown Instrument Company Announces "Electr-O-Vane"

Electronic principles of continuous control have been developed for the first time in the industrial thermometer and pressure gauge field, it was announced by *L. M. Morley,* Vice-President and General Sales Manager of *Brown Instrument Company.*

The instrument, made by the Brown division of *Minneapolis-Honeywell Regulator Company,* will be known as the *Electr-O-Vane.* It is applicable, it was said, in hundreds of processes which demand accurate control of temperature ranging from 100 degrees below zero to 1,000 degrees above.

The Electr-O-Vane control unit operates on the principle that when a metal vane is interposed between two oscillator coils, the state of oscillation can be made to change or stop in an electronic circuit. This change or stopping oscillation causes the electronic circuit to operate a load relay.

The oscillator coils are molded in bakelite and are moisture-proof. Brown Electr-O-Vane control is contained in a compact unit. It is self-contained, easily removed and is unaffected by dust or dirt.

•

Quimby Issues Pamphlet on Centrifugal Pumps

The *Quimby Pump Division* of the *H. K. Porter Company, Inc.,* has just released an eight-page pamphlet on its *Close-Coupled Centrifugal Pump.* Designated as *Model "Q"*, the pump is designed for general service with capacities from 10 to 1000 G. P. M.

This pamphlet may be obtained by writing to the H. K. Porter Company, Inc., 1932 Oliver Building, Pittsburgh 22, Pa., or by contacting any district sales office.

For Sale

•

Slightly Used
BUFFS

LOOSE & SEWED
ANY QUANTITY
ALL SIZES

•

Michigan Buff Co., Inc.
4054 BEAUFAIT AVE.
DETROIT (7) MICHIGAN

ACID AND ALKALI PROOF
LININGS AND MORTARS

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ACID PROOF
CONSTRUCTION

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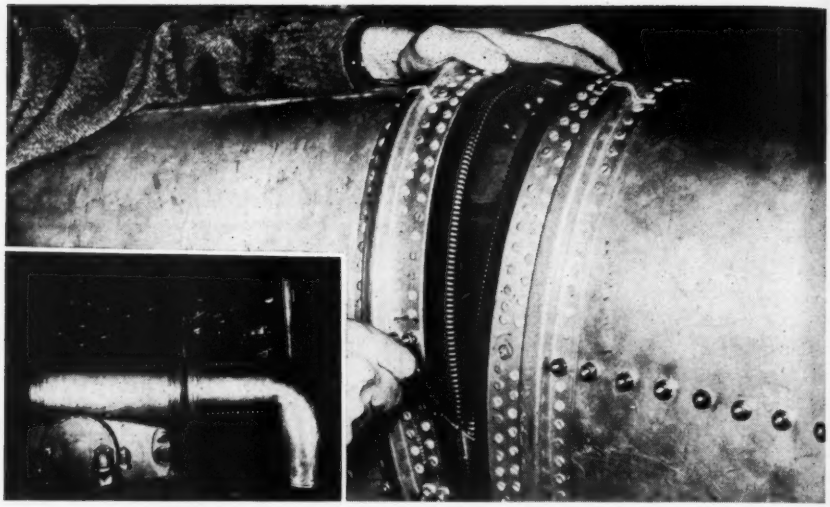
THE CEILCOTE CO.
Consulting and Research Engineers
750 ROCKEFELLER BLDG.
CLEVELAND, OHIO



The *Pressure Sealing Zipper*, unique device of rubber and metal, manufactured by *The B. F. Goodrich Company*, is used to seal sections of the supercharger air ducts on the *Republic XF-12* four-engine army photographic plane.

New Book on Caustic Soda

The *Pittsburgh Plate Glass Company* has just released an elaborate 72-page text designed for use by technical men, buyers and executives interested in the economics of caustic soda; the operations man who is interested in the best procedures for unloading, handling and storing this chemical; the engineer who must design equipment and the student or layman who desires useful data on the characteristics, uses, forms, transportation, constants, etc., of caustic soda. The book is printed in three colors throughout and contains many useful graphs, charts and diagrams as well as being profusely illustrated with descriptive photographs.

Write for a copy on your company letterhead to Pittsburgh Plate Glass Company, Columbia Chemical Division, Fifth Avenue at Bellefield, Pittsburgh 13, Pa., for Form A-100.

•

Hewitt Rubber Issues Folder on New Sand Blast Hose

Described as "*extra-tough*," *Monarch* brand sand blast hose is the subject of a new four-page folder now being distributed by *Hewitt Rubber of Buffalo*, a division of *Hewitt Robins, Inc.*

Highly flexible despite its toughness, *Monarch* is claimed to have ease of handling in such uses as sand blasting foundry flasks, castings and other metal surfaced pieces. It is also used in cleaning stone or brick. Both the inside tube and cover are compounded to resist the abrasive action of sand.

Copies of the printed folder may be obtained by writing Hewitt Rubber, 240 Kensington Avenue, Buffalo 5, New York.

•

Island Equipment Corporation Issues Equipment Bulletin

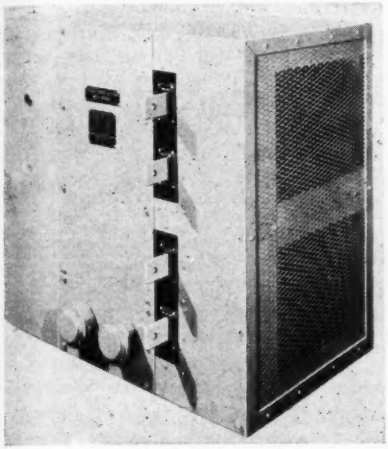
Am eight-page *Bulletin* (*PF-8*) featuring an "All-Purpose Conveyor, Mechanized Work Table for Assembly, Inspection and Packing Operations—a Unitized Assembly or Production Line Unitable", has just been issued by *Island Equipment Corporation*, 101 Park Avenue, New York 17, N. Y.

It is profusely illustrated with installations, cross sections and parts of the equipment.

A copy will be sent to anyone interested upon writing on his company's stationery

New Plating Rectifier

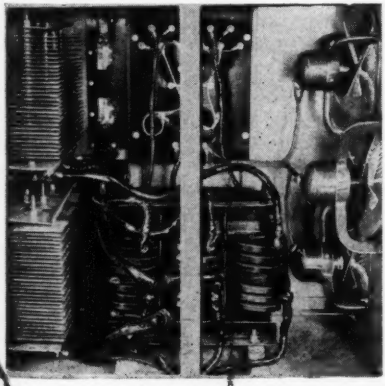
Development of a new electroplating rectifier is announced by *Wagner Brothers, Inc.* Dept. "K", 425 Midland Avenue, Detroit 3 Mich., who will handle all sales nationally



Front View

Claimed as a reliable and economical source of DC power, the *Wagner-Tiedeman Rectifier Assembly* employs metallic selenium-on-aluminum cells, known for their ability to handle momentary overloads of as much as 1000% of normal capacity. Aluminum back plates in place of steel provide maximum cooling, and vitally essential low velocity air circulation is provided by three 10-watt fans with a low amperage of only 1.5.

The Wagner-Tiedeman Rectifier is said to reduce power costs drastically while main-



Rear View

Headquarters

for

Buffs—Cleaners

Buffing Compositions

Nickel Anodes

Chemicals

General Supplies

Equipment

●

JACOB HAY CO.

(NOT INC.)

4014 WEST PARKER AVENUE

CHICAGO, ILL.

Zialite

Reg. U. S. Pat. Off.

For NICKEL PLATING

The one bath especially designed for plating WHITE METAL ALLOYS including ZINC, LEAD and ALUMINUM.

FOR

HARD CHROMIUM

USE

Zialite

ADDITION AGENTS

Send a sample of your present bath to see if it is suitable for conversion to this improved formula.

ZIALITE CORPORATION

92 Grove Street

Worcester 5, Mass.

taining extremely high efficiency, offering an effective rectifying area of over 4,300 square inches. The double-duty transformer is of the two-winding fully insulated type with ample reserve capacity.

Occupying a floor area of five and a half square feet, the rectifier is 34 inches high, 36 inches long, 22 inches wide, and the all steel welded enclosure is designed so that units may be stacked vertically for higher power.

Complete specifications are available in a detailed engineering bulletin issued by Wagner Brothers, Inc.

•

New Free Book Tells How To Stop Fires Quickly

The American-LaFrance-Foamite Corporation of Elmira, N. Y., world's oldest manufacturer of fire-fighting equipment, has just published a 24-page illustrated book entitled *"What You Should Know About Modern Fire-Fighting Devices,"* and offers it free of charge to those who will write for it.

The book is of educational nature and not only describes, but illustrates the proper use of the various types of fire-fighting devices for the class of fire for which each is intended.

Should a small industrial fire get beyond the incipient stage of hand portable fire extinguishers before the Fire Department arrives, this book illustrates the use of larger units which can be put into action to extinguish or hold the blaze under control.

•

New Bulletin on Iridite

A new bulletin describes the *Iridite* finishes, colored or colorless, for zinc and cadmium, their chemical and physical properties, how they are used and where.

It may be had by request on your letterhead to *Rheem Research Products, Inc.*, 4004 E. Monument Street, Baltimore 5, Md.

•

Dust Removal Pamphlet

Breuer Electric Manufacturing Company, 5100 N. Ravenswood Avenue, Chicago 40, Ill., offers a pamphlet showing the Tornado Portable Industrial Vacuum Cleaners and Electric Blowers, Writing Tools and Etchers.

Hammond Machinery Builders Offers New Polishing Machinery Catalog

A new 20-page catalog may be obtained from *Hammond Machinery Builders*, 1600 Douglas Avenue, Kalamazoo 54, Mich.

It covers polishing and buffing lathes, equipment for abrasive belt finishing, and automatic and cylindrical machines; is well illustrated and provides standard specifications for each model.

•

Vulcalock Pipe and Fittings

A catalog section on all its standard pipes and fittings lined with rubber by the *Vulcalock* process has been published by *The B. F. Goodrich Company*, Akron, Ohio, and is available upon request.

Used in many industries where they are needed as protection against corrosive or abrasive action of materials, standard wrought steel, wrought iron, cast iron and Armco spiral welded pipe are lined with several types of rubber by the Vulcalock process to meet specific service requirements. The catalog section describes each of these linings and its function.

•

New Screw-Drum Type Machine Announced by Optimus

A new screw-drum type machine, which has just been announced by *Optimus Equipment Company*, 131 Church Street, Matawan, N. J., manufacturers of metal washing machines and dryers, can be used for washing and drying metal parts, rinsing and drying them, or any part of these operations.

The new machine can also be adapted for a wash-drain, rinse-drain, cold or hot air dry sequence, or for pickling operations. It is particularly designed to handle difficult rinsing and drying jobs involving screw machine or small stamped parts.

The dryer end is completely closed to avoid air loss. The air stream passes through a heater and blower which provides for either hot or cold air blast system.

All parts of the machine are readily accessible for lubrication, maintenance or alterations. Centralized lubrication may be provided.

The Copper Situation

With domestic production probably limited to 800,000 tons annually at current prices, continued imports of some foreign copper will be necessary if the United States is to experience a higher level of industrial activity than before the war, *The Northern Trust Company* has stated in the February issue of its *Business Comment*.

As a result of manpower shortages, increased costs and a relatively inflexible price policy, domestic mine output declined steadily after March, 1944. Current production totals about 65,000 tons monthly but consumption is now exceeding twice that rate, according to the Bank.

This large gap between production and consumption is being bridged by drawing upon government stocks held by the Metals Reserve Company. These stocks have dwindled from 500,000 tons at the end of 1945 to an estimated 125,000 tons on November 30, 1946.

Chile, the article pointed out, is about the only foreign producer whose market is available to U. S. buyers. A large proportion of exportable Canadian copper has been contracted for by Great Britain during the first half of 1947 while production in the empire's colony of Rhodesia also is likely to continue to go to England for the time being. Since the end of 1945, as before the war, all copper produced in the Belgian Congo is going either to Belgium or other European countries.

●

Davis Announces New Advance in Medication of Flesh Wounds

Davis Emergency Equipment Company, Inc., 138 Halleck Street, Newark 4, N. J., in announcing a marked advance in the medication of flesh wounds and abrasions, through the use of *Hydrosulphosol*, states it was first to introduce and sponsor two developments which have become recognized by industrial medical authorities as helpful aids in treatment of wounds. These are (1) a jelly form of tannic acid for the treatment of burns which has been a standard remedy for more than two decades and (2) standardized *Unit Dressings* for field use by public utilities and similar organizations.

Eminent medical investigators reporting upon the clinical potential of sulfhydryl (—SH) ion in high concentration conclusively demonstrate its dramatic activity in cell stimulation and direct relation to tissue respiration and repair, it is said.

Formerly used only in the treatment of thermal, acid and caustic burns, Hydrosulphosol is now being used for the treatment of abrasions and flesh wounds.

This product is supplied in two forms, a solution that may be sprayed and a cream base ointment. It is claimed that Hydrosulphosol therapy requires no bandaging of the area as spraying with this compound or the application of ointment is the only protection needed. Application establishes quickly a flexible coating that promotes healing, and inhibits infection.

Because of the non-caking characteristics of Hydrosulphosol when used as an ointment, inspection of the injured area can be made at any time without employment of painful measures to effect removal.

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Electrodepositors' Technical Society's Celebration

(Continued from Page 405)

MR. E. A. OLLARD said that probably the biggest advance which had been made in the last twenty-one years was the fact that all plating shops of any size now had laboratories attached to them, where such a state of affairs was unknown two decades ago. An important service which the Society had performed was that they had provided a medium whereby electroplaters and chemists could understand one another, where this was in fact impossible in years gone by. The new developments include not only new equipment in the way of metal rectifiers, filters, automatic plant, etc., which result in simpler and faster plating and improved quality, but also, as a result, that better products could be produced much less laboriously and in very much greater quantity.

DR. H. J. T. ELLINGHAM, who had been President during most of the war years, dealt with the position of the Electrodepositors' Technical Society in relation to other societies. He said that the E. T. S. had very fully justified its existence as a separate technical organization, and that its achievements would not have occurred had the Society been a mere branch of some other chemical, physical, metallurgical or electrical institute.

MR. B. J. R. EVANS, who was one of the founders of the Midlands Centre of the Society, then addressed the gathering on some of the early events which had led to the foundation of this vigorous branch of the Society.

Presentation to E. T. S. Publications and Development Fund

MAJOR L. H. PETER said that he was speaking as a representative of one of the industries which the Society had helped in the past, and speaking on behalf of his own Company, The Westinghouse Brake and Signal Company, he congratulated the Society on attaining its majority. He said that it was a source of gratification that in the field of current supply British rectifiers lead the world. It was an interesting coincidence that it was almost exactly twenty-one years ago that they had put down their first laboratory to carry out research work on rectifiers, and as a Company they had been interested in research and development in electrodeposition ever since.

As a practical token of appreciation and also of hopes that the Society's work would be able to continue and expand, it was a pleasure to hand to the President of the Society a cheque from the Westinghouse Brake and Signal Company towards its Publications and Development Fund. Dr. Wernick, accepting the cheque on behalf of the Society, revealed that this was for 250 guineas, and thanked Major Peter and his Company for the very generous gift, which was a splendid start to the Society's Publications and Development Fund. He felt sure that this very inspiring example would be followed up by gestures of a similar kind from others in those industries which had benefited by the developments in electrodeposition and metal finishing processes.

Kenneth G. Wall

Kenneth G. Wall, Librarian of the Detroit Branch, 1945–1946, succumbed to a polio infection on February 7, at the age of forty.

He was born in Paw Paw, Mich., received his early education there and in Kalamazoo, Mich., and entered the plating field in 1927 when he became associated with General Chromium Corporation. In 1928 he joined the Ford Motor Company and was employed there at the time of his death. During the war he helped develop the Electroplating Department for aircraft parts in the Engineering Building at the River Rouge plant. He worked there as General Division foreman. At the cessation of hostilities he was transferred to the plating department for automobile service parts as foreman of the day shift.

He was elected to membership in the American Electroplaters' Society in 1942 and was a member of the Electrochemical Society.

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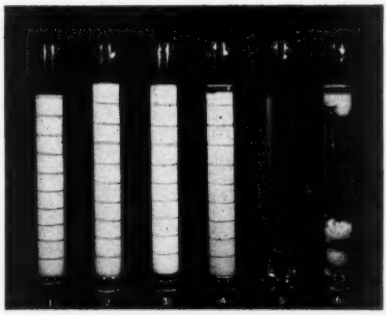

Unretouched photograph showing the comparative stability of Emlon (1, 2 and 3) and a leading competitive product (4, 5 and 6).

Above you see the following 5% emulsions, after standing for 24 hours:
(1) Emlon in tap water; **(2)** Emlon with 2.5% of sulfuric acid added; **(3)** Emlon with 2.5% of caustic soda added; **(4)** Competitive product in tap water; **(5)** Competitive product with 2.5% of sulfuric acid added; **(6)** Competitive product with 2.5% of caustic soda added. Note separation, or complete breakdown, of 4, 5 and 6.

This illustrates the unusual *stability* of emulsions formed with Emlon. This stability results in better and faster cleaning action, longer cleaning solution life and low cleaning costs.

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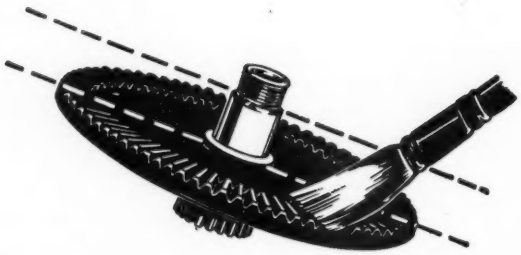

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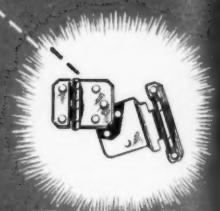

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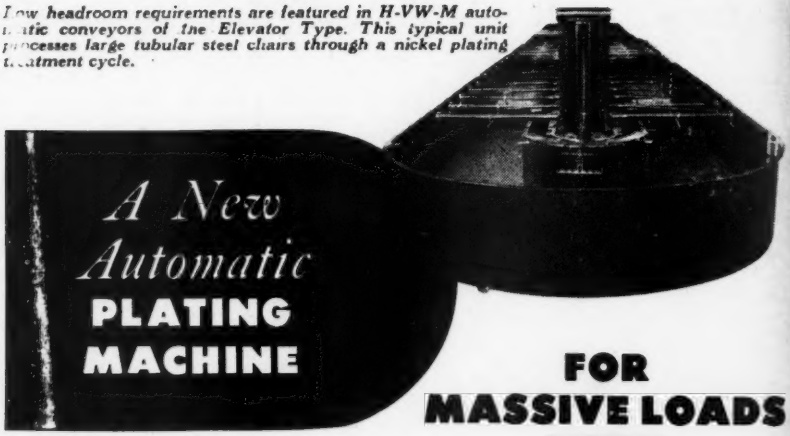

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